

NTPC SAIL POWER COMPANY (P) LIMITED

1X250 MW ROURKELA POWER PROJECT

TECHNICAL SPECIFICATION FOR

LOW VOLTAGE SWITCHGEAR (ESP, CHP & AHP PACKAGE)

BHEL DOCUMENT NO. : EPD-TS-CPBG-CPJ07-11, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE – 560012**



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(PP-III:1X250MW)**

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VOLUME

SECTION -

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IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO, & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE
(REFER INSTRUCTION NO. 1 OF 'INSTRUCTIONS TO BIDDERS')



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INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer:
 - a) Un-priced copy of Annexure-A, B, C, D, E1, E2, F1, F2, G, H, I duly stamped and signed by the bidder.
 - b) Complete dimension of all the boards including no. of panels, dimensions of each type of panels, module size of each type of feeders and minimum clearances required on all sides for each type of panels.
 - c) No. of Vertical consider by vendor for each boards are to be compulsory given along with offer.
 - d) A copy of the sheet "Instructions to Bidders for Preparing Technical Offer" duly stamped and signed by the bidder.
 - e) A copy of sheet "List of Contents" duly stamped and signed by the bidder.
 - f) Technical deviation/ clarification, if any
 - g) No. Of Breaker panels, No. of MCC panels, Weight & Dimensions of all boards.
2. No technical submittal such as copies of type test certificates, data Sheets, write-up, drawing, technical literature, etc. is required during tender stage. Any such submission, even if made, shall not be considered as part of offer.
3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the Item description/ quantities, notes etc. from those given in various annexures to Section-C of specification shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).
6. Bidders to quote for all items/sub items even if those are not in their manufacturing range.
7. In case of any ambiguity in specification between various sections and end customer specification vendor should clearly brought out in technical deviations failing in which BHEL will have choice to prefer which ever it suits at later stage for which vendor should accept.
8. Vendor should bring out clearly in deviation sheet if any.

BIDDER'S STAMP & SIGNATURE

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) PROVENESS CRITERIA	
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5.5 L T SWITCHGEAR

5.5.1 Bidder/Sub-vendor should have manufactured and supplied at least a total of four hundred & fifty (450) nos. draw out type Air circuit breaker panels and/or draw out motor control centre panels complete in all respects with fault rating of at least 45 kA for 1 sec. and 105 kA (peak) under a single order and these panels should have been in successful operation for a period of not less than two (2) years prior to the date of techno-commercial bid opening.

5.5.2 Bidder/Sub-vendor should have manufactured and supplied at least one hundred & fifty (150) nos. of draw out circuit breaker panels with Air Circuit Breakers having fault rating of at least 45 kA for 1 sec, 105 kA MAKING and 45 kA BREAKING, which should have been in successful operation for a period of not less than two (2) years prior to the date of techno-commercial bid opening.

Note: Each Single Front Panel shall be counted as one (1) Panel, Double Front Panel as one (1) Panel and Air Circuit Breaker Panel as one (1) vertical Panel.

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01.00.00 GENERAL INFORMATION

01.01.00 PREAMBLE:

NTPC – SAIL Power Company Private Limited (NSPCL) is a joint venture of two Maharatna PSUs i.e. NTPC, an integrated power major and SAIL, one of the largest steel producing companies of India with equity ratio of 50:50, formed on 7th March, 2001. NSPCL took over Captive Power Plant-II (CPP-II) located at Durgapur Steel Plant (DSP) and Rourkela Steel Plant (RSP) having installed capacity of 120 MW (2x60 MW) each.

NSPCL have an installed capacity of 814 MW as on March, 2012.

Long leaps are being undertaken by NSPCL to expand its areas of activities in keeping steady and uninterrupted power supply to steel plants of SAIL. NSPCL in its corporate goals has always been very progressive in keeping pace with the advancement in the generation of power as well as development of the country. NSPCL has planned to diversify its areas of business with more power generation to cater uninterrupted power supply to SAIL (which is under expansion stage) as well as selling power to the national grid.

The Electricity Act 2003 had added more flexibility for the companies to install power plant at any suitable locations for its own use as well as selling power to any consumers and/or power trading companies through open access. In view of this and due to acute power shortage in the state of Orissa and captive power requirement of SAIL (which is under expansion stage), NSPCL is planning to set up a new coal based thermal power plant of 1x250 MW capacity at Rourkela in Orissa.

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01.02.00 SITE INFORMATION

A. Location & Land Availability:

The proposed unit of 1x250 MW will be installed on the western side of existing 2x60 MW units within the boundary of Rourkela Steel Plant in Sundergarh district of Orissa.

Approximately 80 acres of land is available for construction main plant and accessories. For ash dyke about 70 acres of land is available at a distance of approx 6 KM from plant towards southwest. Presently most of land is filled with blast furnace slag. The main power house building of proposed unit of 1x250 MW will be located on western side of existing 2x60 MW switchyard. The indicative latitude & longitude of the proposed site is as follows:

- Latitude : 22°13'19" N
- Longitude : 84°53'51" E

B. Availability of Infrastructure Facilities

Road

The site is connected by road of NH-23 through a link road from a road junction at Panposh located approx. 10 KM from proposed site.

Railway siding

The nearest railway station Rourkela is situated about one km from the proposed plant site. A new railway siding will be developed for receiving coal from the source.

Airport/Air strip

The nearest airport is at Ranchi which is about 170 KM by rail and 225 KM by road from the proposed site.

Seaport

The nearest seaport is at Paradip (Orissa) which is around 400 Kms from the proposed site.

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C. Climatological Data

The following meteorological data shall be taken into account for design of plant and equipment. Site conditions shall be assumed to be as follows for tender purpose.

1. Average elevation above mean sea level : 194m
2. Barometric pressure : 983 mb
3. Ambient temperature
 - a. Absolute maximum : 48 °C
 - b. Absolute minimum : 6 °C
4. Relative humidity (Maximum) : 65 %
5. Annual Average Rainfall : 2656.6 mm
6. Heaviest in 24 Hrs. : 257.8 mm
7. Seismic Zone : Zone-II (As per latest Revision of IS 1893 /2002) Part-I

D. Fuel

a. Primary Fuel, Coal

Coal will be supplied from Ramnagar coal mines which is owned by SAIL. Analysis of Coal and Ash is annexed with this TS. The analysis is indicative. Detail analysis is under process and will be furnished later.

b. Secondary liquid fuel

Light diesel oil (LDO) shall be used for start-up, coal flame stabilization and low load operation of the steam generator. LDO shall be used for cold start up of the steam generator. Source will be from nearest depot of IOC/BPCL.

E. Water System

Brahmani river - Water is proposed to be drawn from an appropriate intake water pumping station at Tarkera near the left bank of the river Brahmani which is about 8 km from the proposed site.

Chemical analysis of Raw Water shall be furnished soon.

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SCOPE OF ENQUIRY



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- 1.0 This specification covers the design, manufacture, relay parameterization and site support, one suitable Ethernet switch per board, inspection and testing at manufacturer's works, proper packing and delivery to site of **LOW VOLTAGE SWITCHGEAR** as mentioned in different sections of this specification for 1X 250 MW ROURKELA TPS, NSPCL.
- 2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to vendor's guarantee.
- 3.0 The general terms and conditions, instruction to tenderer and other attachment referred to elsewhere are hereby made part of the tender specification.
- 4.0 The tendered shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Deviations, if any should be brought out very clearly on deviation sheet enclosed with specification only. Otherwise it will be presumed that the tenderer's offer is in line with what has been stated/ asked for in this specification.
- 6.0 The offer should be complete with technical data, catalogues, brochures and drawings as applicable.
- 7.0 Qualification data: In order to be able to propose to the client the proven-ness of the equipment's/ item offered, the bidder is required to elaborate details of experience, capabilities, reference list etc. in the offer.
- 8.0 The documents shall be in English language and MKS system of units.

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CHAPTER-11.0

TECHNICAL SPECIFICATION FOR 415 V PCC, MCC, DB, STARTER PANELS

01.00.00 Scope

01.01.00 This specification covers the following equipment complete with all accessories:

- a) 415V Power Control Centers
- b) 415V Motor Control Centers
- c) 415V Distribution Boards
- d) Fuse Distribution boards/Panels for Solenoid valves
- e) DC & AC starters
- f) 220 V DCDB
- g) Miscellaneous panels as per system requirement

The exact number of boards shall be finalized by the bidders. In case additional boards are required which have not been included in the enclosed SLD, the same shall also be included by the bidders in their scope.

01.02.00 Base channel frame of all boards along with necessary mounting hardware is included.

01.03.00 All relevant drawings, data and instruction manuals.

02.00.00 Codes and Standards

IEC : 60947, IS : 13947

02.01.00 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

02.02.00 Equipment and material conforming to any other standards, which ensure equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted .

02.03.00 The electrical installation shall meet the requirements of Indian Electricity Rules as amended up to date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

03.00.00 System concept and Design criteria

03.01.00 **415V power** distribution in the Plant area shall be by means of PCCs, MCCs, DBs, SVBs and Distribution panels.

03.02.00 The PCCs/MCCs/DBs/VDMCCs/distribution boards shall be used for providing power to various LT loads of the plant. PCCs, MCCs, distribution boards shall be planned as per requirement in various load centres.

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- 03.03.00 The PCCs, MCCs and distribution boards for feeding all AC & DC loads shall be included by the bidder. Loads include welding transformers, lighting loads, power sockets, maintenance sockets etc. also.
- 03.04.00 The equipment shall be located in a hot, humid, and tropical atmosphere, heavily polluted at places with coal dust and/or fly ash.
- 03.05.00 Duty involves **direct-on-line starting** of large induction motors and also under certain emergency conditions, automatic transfer of loads from one source of supply to another.
- Motor starting current shall be 6 times the full load current subject to tolerance (+20%) as per .IS. PCCs/ MCCs shall be designed accordingly..**
- 03.06.00 **Busbars of PCCs** shall be sized to carry continuously the LV side current of the transformer **plus a 20% margin.**
- Busbars of MCCs/DBs/VDMCCs/FBs shall be sized to carry continuously the total running load of the system (including anticipated future load, wherever applicable) **plus a 20% margin.**
- All busbars shall be capable** of withstanding the **mechanical forces** and **thermal stresses** due to maximum short circuit current.
- 03.07.00 In-cubicle ratings of incomer and bus-section breakers/switches shall be identical to the associated busbar rating.
- 03.08.00 For continuous operation at specified ratings, the temperature rise of various equipment/components shall be limited to the permissible values specified in relevant standards and/or this specification.
- 03.09.00 Circuit breakers shall not produce any harmful over voltage during switching off of induction motors. If required, surge protective devices shall be included in the scope of supply to limit over voltages.
- 03.10.00 Incomer and Bus-couplers of all PCCs and MCCs shall have provisions for **remote operation from the common control room through DCS/ PLC, ECP/SACP etc. as the case may be.**
- 03.11.00 **Power supply to Solenoid valves shall be taken from a separate distribution board. Power supply to this distribution board shall be derived from the respective MCCs/ACDBs through suitable power packs. Each distribution panel shall have dual power supply sources.**
- 03.12.00 **EMERGENCY SWITCHGEAR**
- Emergency switchgear shall be provided which is normally fed by 415V unit switchgear . When power supply from 415V unit switchgear fails, the Emergency bus shall be disconnected from it and shall be connected to DG bus i.e., start impulse shall be given to DG sets .DG shall auto close on to its bus.
- Control of Emergency switchgear breakers of unit shall be possible from the Electrical Control Panel of the respective unit located in the Common Control Room and also from DCS.**

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All control/indications/annunciations for DG system shall be available in the Station Auxiliary Control Panel (SACP) located in the Control Room also.

- 04.00.00 **TECHNICAL SPECIFICATION**
- 04.01.00 **Power Control Centre**
- 04.01.01 Power Control Centers (PCCs), shall be used to feed Motor Control Centers and motors rated from 90 KW up to and including 160 KW for CHP and 200KW for remaining plant area. All PCCs shall have **duplicate incomers** and **a bus-section**, each section rated for **100% of the loads** connected to the switchgear. **Incomers, bus-section, and all outgoing feeders of a PCC shall be breaker controlled.** Distribution of outgoing feeders shall be such as to ensure uniform loading on each section of the PCC.
- 04.01.02 The switchgears shall be provided with suitable number and type of outgoing feeders for the respective auxiliary loads of the system/area, power supply feeders to various panels, lighting, space heating panels, control cabinets and all other loads encountered in the plant. In addition, following feeders shall be provided in each bus section of each switchgear.
- (a) **Spare feeders: 20 % or minimum** of one no. feeder of each rating and type (above quantity is the minimum requirement, at the time of handing over the plant. Any additional quantity required for any increase/changes during detailed engineering stage also shall be duly considered.)
 - (b) Bus VT module: 1 No. for each bus section
 - (c) Switchgear 240V, 1 phase space heating: 1 No.
 - d) Line VT module 1 No. for each Incomer for synchronising purpose.
- 04.01.03 **Short Circuit Currents**
- The short circuit current of **415V bus is 50kA for 1 sec.** **The momentary current rating shall be 2.1 times** this value.
- 04.01.04 **Continuous Currents**
- The continuous current rating of the bus bars, their incomers, bus couplers of the switchgear which are fed by the transformers shall be rated at the LV side full load current of the corresponding transformers with **20% margin** rounded off to the next higher standard rating.
- The continuous current rating of the bus bars, incomers, bus couplers of the switchgear fed from other switchgears shall be the maximum load on the bus due to all the running auxiliaries during any operation condition **plus 20% margin rounded off to the next higher standard rating.** **For the load calculation, load factors to be considered shall be 0.9 for continuous loads, 0.4 for intermittent loads.**

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04.01.05

Constructional Features

Metal clad Indoor type, single front, floor mounted, free standing design, single/double tier panels, with dust Proof construction. The construction shall be compartmentalized with metal / insulation partitions between compartments.

Cold rolled sheet steel of not less than 2mm thickness for load bearing members and 1.6mm thickness for other members.

Circuit breaker shall be mounted on fully drawout truck with service, test and isolated positions and complete with following safety interlocks and safety shutters with padlock facility:

Truck cannot be moved in or out of cubicle when the breaker is closed.

CB compartment door shall be mechanically interlocked so that it shall not be possible to close the CB in plug position when the door is open.

Insertion of breaker into service position not possible if the shutters are not free.

Name plate for each incoming, buscoupler and outgoing at front and back on the fixed portion of the panel.

All panels shall have space heater with switch and cubicle illumination lamp with door switch.

The back door shall be hinged type.

Enclosure shall conform to IP52(min.). However, for busbar chamber of switchboards rated above 1600A, degree of protection shall be IP-42(min.).

Busbars:

Three phase, neutral (with at least 50% rating of main bus bar) and continuous earth Bus. Bus bar and tapping shall be provided with PVC Sleeve.

Bus bars shall be provided with colour-coded sleeves.

Rating of horizontal buses shall be in line with incomer rating and vertical bus bar for the compartment shall commensurate with all outgoing feeders.

Temperature rise of bus bars shall not be more than 40 deg C above ambient of 50 deg C

Bus bar and connection shall be of high conductivity Aluminium alloy / copper of suitable hardness and purity complying with as per IS 5082.

Air Circuit Breakers:

Electrical Features:

Air break triple pole draw out type conforming to IS 2516-1980.

Rated continuous current as specified.

Symmetrical interrupting capacity shall be 50kA.

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Auxiliary contacts : **6 NO + 6 NC** minimum convertible from NO to NC and vice-versa at site.

Make and Continuous current : 10 amps.

Breaking current

AC - 4 amps at 240 V

DC - 0.5 amps at 220 V

Operating Mechanism:

Motor operated mechanism as applicable. **Spring charged stored energy** mechanism to ensure high speed closing and tripping independent of the operating forces.

Anti pumping and trip free feature.

Emergency tripping by mechanically operated trip push button (shrouded to prevent accidental closing) acting directly on the trip bar.

Mechanical indication to show:

- a) Closing spring charged.
- b) Breaker ON / OFF / TRIP indication.

Breaker to close only when spring fully charged.

Non-reset type operation counter.

Charging of closing spring by motor.

Closing by closing coil (operating range 85% to 110% of rated voltage).

Spring charging motor and closing & tripping coil suitable for rated control voltage (220 V DC). Tripping by trip coil (operating range 70% to 110% of rated voltage).

One opening and one closing operation without control supply.

Provision also for manual closing with spring charging motor automatically decoupled as soon as charging handle is inserted.

Suitable LOCAL/REMOTE selector switch (lockable type) shall be provided for all breaker modules.

Drawout Features:

3 distinct position viz. service, test, and isolated with the door closed.

Mechanical position indication and locking / latching facility for all 3 positions.

Power connections – self aligning, plug-in type contacts.

Control connections – sliding or plug socket type, mechanically coupled, to prevent wrong insertion, **continuous rating 16 amps minimum.**

Automatic safety shutters to prevent accidental contact with live parts when the breaker is withdrawn.

The **break contact shall** be on the breaker side.

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Safety Interlocks:

Breaker cannot be closed in any intermediate position other than the 3 fixed positions.

With the breaker closed, it cannot be racked in from any of the 3 position to another.

Mechanical stopper to prevent accidental falling while withdrawing.

Breaker cannot be racked in from isolated to 'test' position with the door open together with provision for defeat of this interlocking, however, the door can be closed only when the breaker is brought back to 'isolated' position.

Door can be opened only when breaker is OFF and is in 'Isolated' position.

Remote closing of breaker not permitted with door open.

Insertion of breaker into 'Service' position not possible if the shutters are not free.

Internal Control Wiring

Control Wiring by 660 V grade PVC insulated, single core stranded copper conductor of min. cross section 1.5 sq.mm. CT/PT wiring shall be of 2.5 sq. mm cross section.

Flexible wire, protected against mechanical damage for wiring to door-mounted devices.

Wires identified at each end in accordance with schematic diagrams by interlocked type ferrules.

All connections external to a feeder, all the auxiliary contacts of the LT breaker and at least 1 NO + 1 NC spare contacts of the relays brought to terminal blocks.

Interconnection between panels of adjacent shipping sections to be brought out to a separate terminal block, wires for interconnection properly labelled, looped and bunched inside the panel for connection at site.

Not more than two connections on any one terminal.

All spare contacts wired upto terminal block of the panels.

650V grade multiway terminal blocks of non tracking moulded plastic complete with insulated barriers, stud type terminals, washers, nuts and lock nuts and identification strips.

Power and control terminals segregated.

Open type control terminals of minimum rating 10 A suitable to receive 2.5 / 4.0 sq.mm copper conductor. It shall be ensured that there is free access to the control terminals after termination of all cables.

20% spare terminals in each control terminal block.

Power Terminations:

Suitable for accepting cables / bus trunking as specified.

Protective Devices

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The circuit breaker shall be provided with the following protective devices with suitable setting ranges.

- Required Protections mentioned elsewhere.
- Shunt Trip coil for remote tripping rated for 220V DC. It should trip at minimum 70% of rated voltage.

All the control, protection and signalling circuits of each circuit breaker (incoming and outgoing feeders) shall be fed through MCBs and the individual circuits may be protected by HRC fuses.

Control Supply

Two 220 V DC feeders shall be provided in each board for power supply of control, shunt tripping and annunciation purpose.

Control supply shall have supervision facility, alarm shall be provided for non-availability of any one of the control supply.

MCCBs/MCBs shall be provided on incoming sides of supplies. **Control buses of two sections shall be connected through auto changeover scheme.**

LEDs shall be provided for the indication purpose.

Isolation arrangement shall be provided on each panel to facilitate fault location and testing. Separate fuses shall be provided for spring charging motors, for indication lamps and for closing / Tripping circuits of each cubicle.

Breaker Handling Truck

One for each switch board, for withdrawing the breakers from the switch board.

Height of platform adjustable to suit the levels at which the breakers are mounted.

Adequate mechanical strength for handling the largest breaker.

Guide rails and stops.

Truck shall be hydraulic operated.

04.02.00

LT MOTOR CONTROL CENTRES

04.02.01

Motor Control Centers (MCCs) shall house breaker panels, **MCCB & contactor** operated modules etc. All MCCs shall have duplicate incomers and a bus-section. **All incomers and Bus-couplers shall have ACB's for MCCs rated above 600Amps and shall have MCCB's for MCCs rated upto 600Amps .** Suitable interlock shall be provided to satisfy the condition of two out of three closing. All outgoing feeders shall be breaker/MCCB or switch fuse operated with or without contactor depending upon the rating and application. All motor feeders other than those operated through breakers shall have Bi-metal overload relay with single phase preventor for protection. **All motors above 30 kW shall have CT operated overload relay with single phase preventor for protection.** All breaker operated motor feeder modules shall have numerical motor protection relays that can be interfaced with the DCS/PLC. Distribution of outgoing feeders shall be such as to ensure uniform loading on each section of the MCC.

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04.02.02

Constructional Features

General:

Fully drawout type with modules having service, test and isolation positions.

Floor mounting, free standing with base channel for fixing on the inserts on the floor.

Single/double front, totally enclosed, dust and vermin proof.

Degree of protection IP-51 or better, IP-54 for locations in the shops outside rooms.

Sheet steel with thickness not less than 2.0mm for load bearing and 1.6mm for other members.

Possibility of extension on either end of MCC.

Removable lifting facilities for each transport unit.

Designation plate for each MCC.

Inscription plate for each module.

Length of each transportable unit not more than 2.4 M

Compartment design

Pilot devices operable from the front.

Operating height not to exceed 1800mm.

Vertical wire way to accommodate all cables.

Components and devices accessible from front.

Protection against accidental contact with live parts while maintaining a compartment and keeping others in service.

Anti rusting, un drilled removable gland plates to be provided.

Cable entry from bottom unless otherwise specified.

Compartment door interlocked with the main power isolating device for safety with provision for defeating it by authorized person.

All compartments to have covering at the bottom to preclude entry of dust, rats, lizards etc.

Space of about 200mm to be left vacant at bottom throughout the length of the MCC for ease of cabling.

Power circuit isolation device to have facility for locking

In test position module control supply shall be disconnected and provision shall be available to test the control circuit through test bus, obtained from separate control transformer provided for this purpose.

04.02.03

Busbars

Busbars shall be of aluminium alloy / copper.

Power busbar joints shall be bolted type with spring washers. Bolts and washers shall be cadmium plated.

Busbars shall be 3 phase and neutral running horizontally or vertically.

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Busbar sizes to be selected in accordance with nominal current rating of incoming Circuit breaker for full short-circuit power.

All bus connections shall be provided with anti-oxide grease. Adequate contact pressure shall be ensured by means of two-bolt connection with plain and spring washers and locknuts.

Bimetallic connectors shall be provided for connections between dissimilar metals.

Busbars shall be insulated by colour coded PVC sleeves,

Neutral bus shall run on insulators with facility for connection to earth busbar.

Earth bus shall run throughout the length of MCC at bottom and for each vertical section.

Busbar configuration shall be red-yellow-blue for three phase AC power and red - blue for DC control supply from front to back or top to bottom or left to right as viewed from front.

Temperature rise not to exceed 40 degree C above the peak ambient temperature of 50 deg C.

Removal of busbars shall be possible without disconnecting external cables.

04.02.04

Control transformer

415/110 dry type – 2x100% for each bus-section

4.03.00 **EMERGENCY MCC**

Emergency MCC (EMCC) shall be provided which shall be fed from Unit board as indicated in the SLD. Construction and other features of Emergency MCC shall be similar to other MCCs.

04.04.00

SPECIFIC REQUIREMENTS

04.04.01

All the incomers and Bus couplers of 415V Switchgears, MCCs and outgoing feeders of 415V switchgear shall have ACB and shall be provided with **Microprocessor based numerical relays**. All the modules in switchgears and MCCs shall be controlled from **DCS/PLC through coupling relays**. The **coupling relays shall** be located in the respective modules.

04.04.02

The scope of supply shall include all the material including all the interposing **relays, gateway/data concentrator and interconnecting cables**. All cables for further connectivity to DCS/PLC shall be provided. It shall be possible to configure the settings of the numerical relays from the DCS/PLC.

Numerical relay shall have the following functions

- **Protection**
- **Metering**
- **Monitoring**

The following control, metering & monitoring facility shall be provided **in DCS/PLC**.

- Control of breakers / contactors (Close / Open / Trip)
- Program or modify set points

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- Under voltage auto restart
- Load or save set points from or to a disk
- Read actual values
- Monitor status
- Read pre-trip data and trip record
- Display of all control status
- Display of all maintenance parameters
- Display of fault parameters
- Logging of all alarms/trips with time stamping
- Display dynamic trending of actual values
- Maintenance Information
- Graphical display of SLD and on line status
- Get help on any topic
- Print

04.04.03

Apart from protection, metering and alarm indication, the DCS/PLC system shall display healthiness of the drive/feeder, status of permissive digital inputs, reason for inhibit in normal display, without any abbreviations.

- User Interfaces
Numerical relays and DCS shall have common Protocol for proper Interface and communication
- Serial Communication
The Numerical relays shall have RS 232 or RS 485 for serial communication. It shall be possible to set the settings of Numerical relays from the front key pad or through RS 232/485 port.

Numerical relays of all modules in a 415V switchboard / MCC shall be interlinked in daisy-chain arrangement or multidrop arrangement and shall be serially interfaced to plant DCS on relevant protocol on RS 232/485 link. For this purpose, necessary gateway shall be provided. Each module shall be controlled and monitored from DCS through this serial communication link.

Dual redundant network/data bus/Data concentrator/power supply units shall be supplied. It shall be possible to add/replace/remove any Numerical relays from the data bus without affecting serial communication. In the event of one of the conductors breaking, the data transmission changeover should be bumpless. The protocol and hardware shall support dual redundant data concentrator and upward serial communication.

Software for numerical relays shall be supplied and loaded in DCS/PLC.

Close, open operations of the control gear in Test position shall be effected for all 0.4 KV modules through Push Buttons provided in the modules.

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All Modules shall have ON, OFF&TRIP indications through LED indication lamp

The switchgear manufacturer shall coordinate with the DCS/PLC manufacturer for protocols/mapping, procedures, interface and testing.

All the switchgears / MCCs shall be designed for bottom entry of cable.

For breaker control in each switchgear 2 Nos. 220V DC control supply shall be provided with auto-change over to either supply.

20% spare terminals shall be provided for each module.

Insulation Level:

- Rated insulation voltage 1100 V
- One minute power frequency withstand voltage.
 - 2.5 KV for power circuits.
 - 1.5 KV for control circuits.

Clearance in air (minimum)

- Phase to phase – 25 mm
- Phase to earth – 25 mm

04.04.04

Module Details

Incomers & Bus Couplers

All the switchgears & MCC shall have two incomers and a bus coupler arrangement.

The incomer modules and bus coupler modules of all the switchgear & MCC shall be air circuit breaker controlled.

The incomer modules shall be interlocked with their upstream breaker such that they can be closed only when upstream breaker is closed and trip automatically when upstream breaker is tripped.

The following minimum protections shall be provided for incomers and bus couplers.

- 3 phase inverse time over current protection
- Earth fault protection

CTs shall be provided for protection and metering.

Incomer shall have current transformers as per the requirement.

Ratings of incomers and bus coupler shall be same.

Feeder Modules of MCC:

Feeders for all drives shall consist of MCCB/Switch Fuse Unit(SFU) with contactor as applicable according to the details described in motor feeders.

Open/Close/Trip or ON/OFF/Trip indication lamps(LED) for each drive shall be provided.

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The short circuit release of MCCBs shall be selected such as to avoid tripping during starting of drives.

Warning markers shall be provided for 'CAUTION EXTERNAL VOLTAGE'

At least 20% of feeder modules of each type & rating subject to a minimum of one module shall be provided as spares. Spare modules shall be completely wired up.

10% of control terminals in each module shall be provided as spare subject to a minimum of 2.

04.04.05

Changeover Scheme

All the switchgears with sectionalised buses shall be normally operated with the bus coupler breakers open.

Manual changeover/auto changeover between the two normal incomers and their bus-coupler shall be provided with the following features.

Manual changeover from one incomer to another with momentary paralleling of the two supplies after checking through synchrocheck relay.

Auto changeover from one incomer to another after trip of first incomer.

If there is a prolonged under-voltage on any one of the bus sections, the respective incoming breaker shall trip and the bus coupler breaker shall close provided voltage is available on the other bus section. Total changeover time shall not exceed 1.5 seconds. This auto changeover shall be blocked if the incoming breaker had tripped either on a bus fault or manually. Changeover back to the normal source of supply shall be effected manually.

The automatic transfer circuit shall be controlled over by an auto-manual change-over switch. The bus section breaker shall be allowed to close only if there is no earth fault or O/C fault on affected section of the 415V switchboard bus-bars.

Manual live changeover facility shall be provided for all the switchgears. When planned outage of one of the normal incoming supplies is required, the respective incomers shall be tripped automatically after the bus section breaker is closed manually. For this purpose, a selection shall be provided on the CRT in DCS/PLC for selecting the incomer to be tripped. Thus, depending on the selection made, incomer to bus section – A or to bus section – B shall be tripped once bus section breaker is closed manually, thus maintaining continuity of supply.

Manual dead bus closing of a bus-coupler after an intentional manual trip/outage due to under voltage of any one incomer shall be possible. However, restoration to normal shall be manual.

A timer with a time delay on pick up of 0.5. - 5 sec. for annunciation of the running breaker failing to trip within a preset time (i.e. If the two sources remain paralleled for more than a preset time) shall be provided.

When the normal supply is to be brought back into operation, the incomer breaker shall be closed whereupon the bus coupler shall trip automatically.

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Latest breaker tripping provision shall be included in the change over scheme in addition to annunciation.

04.04.06

Motor Modules

90KW and above capacity motors shall be fed by ACBs.

Less than 90kW capacity motors shall be fed by SFU/MCCB and contactors through MCC.

More than 30kW capacity motor feeders shall be provided with 240V 1-phase space heating supply arrangement. As well as ammeter shall be provided locally, display in DCS also

Control

Close & Open control of the Incomer & Buscoupler breakers and start/stop control of all motors/outgoing feeders shall be from DCS/PLC system through the interposing relays.

4.04.07

Alarms/Indication/ SER Points

Following indications/alarms are the minimum to be provided in the CRT in control room through serial link from Numerical relay in each module. Additionally indications/alarms considered necessary during detailed engineering stage shall also be provided. Out of these some shall be selected for the sequential event recording. The control/interlock schemes for various types of feeders shall commensurate with their application. Single Line Diagram of all 415V switchgear and MCC shall be available in CRT.

(a) **Breaker Panel**

(i) Status indication

- Breaker ON
- Breaker OFF
- Breaker in remote
- Breaker in service
- Breaker in test
- Spring charged
- Panel AC supply failed
- Breaker not available
- Protective relay faulty
- Trip circuit healthy

(ii) Alarms

- Protective relay/ O/L Relay operated
- Trip circuit unhealthy

(iii) Control on CRT for breakers

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(b) VT panel

- Bus under voltage relay operated
- Bus P.T fuse failed
- DC supply-1 failed
- DC supply-2 failed
- Bus PT-DC not available alarm

(c) Motor feeders

- Comprehensive motor protection numerical relay operated

Motor feeders (without Numerical relay)

- Drive running Forward/Reverse
- Drive stopped
- Bimetal overload relay operated

(d) Service Transformer Feeders

- Winding temperature high alarm
- Power supply failure to temperature surveillance unit
- Buchholz relay alarm (for oil type transformer)
- Oil temperature alarm (for oil type transformer)
- Pressure relief device operated (for oil type transformer)
- Power supply failure to temperature surveillance unit (applicable for dry type transformers)

(e) Analogue parameters

All the parameters indicated under METERING AND PROTECTION below shall be displayed in the CRT in control room.

(f) Control

ON/OFF control and ON/OFF & fault/discrepancy indication for each of the breaker shall be provided in the CRTs.

This above list is only indicative. Additionally indications/alarms considered necessary during detailed engineering stage shall also be provided by bidder.

04.04.08

Metering And Protection

Numerical relays provided for ACB controlled modules shall have following protection / metering. The minimum protections / metering required for various typical feeders shall include, but not be limited to the following:

ACB Controlled

(a) Incomers

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	Protections	Metering
	Over current protection	Current on all the 3 phases
	Earth fault protection	Voltage – phase to phase, phase to neutral
	Under voltage	KW
	REF protection (For incomers through transformers)	kWhr
	Synchronising check relay	

b) Buscouplers

	Protections	Metering
	Over current protection	
	Earth fault protection	
	Synchronising check relay	

(c) Motor feeders

	Protections	Metering
	Composite motor protection to cover a minimum of protections such as over current, short circuit, earth fault, locked rotor, Negative phase sequence, thermal alarm etc.(for large motors $\geq$ 90kW	Current Voltage kW KWh

The minimum protections/metering required for the following feeders shall include, but not limited to:

(a) Bus PT /Line PT Modules

	Protections	Metering
	Under voltage protection	Voltage – phase to phase, phase to neutral
	Fuse failure protection	

(b) Motor feeders(SFU / MCCB with Contactors)

	Protections	Metering
	Bimetallic Thermal Overload relay (with single phase preventor), short circuit protection (through fuse/MCCB)	Phase current (for motors of rating above 15kW)

(c) Incoming feeders for ACDB

	Protections	Metering
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	Short circuit protection (if MCCB)	Phase Current (1 phase)
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(d) Outgoing feeders of ACDB

	Protections	Metering
	Short circuit protection (through fuse)	Phase Current (1 phase) for modules rated 63A and above.

Note:

1. For incomers and bus couplers, voltmeters with selector switches and ammeters on all phases shall be provided on the boards in addition to metering through numerical relays.
2. Apart from protection relays, each electrically operated breaker shall be provided with anti-pumping (94), trip annunciation (30), lockout (86) and trip circuit supervision (74) relays. Lockout relay shall be hand reset type.
3. Fuse failure relay shall be provided on the secondary side of voltage transformer to monitor H.V. & L.V. fuses.

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04.05.00

POWER DISTRIBUTION BOARD (PDB) / ACDB

PDB/AC Distribution Board (DB) shall house switch fuse modules / MCCB modules only. They shall have duplicate incomers and a bus-coupler. Wherever bus-couplers are provided, distribution of outgoing feeders shall be such as to ensure uniform loading on each section of DB. Board shall be single/double front, metal clad, front matched, dust and vermin proof, draw-out fully, compartmentalized and extensible on both sides with IP52 type enclosure.

Shall have base channel of size ISMC 75.

Shall have isolated busbar chamber for main busbar at the top, running through out the length of the board. Chamber shall have removable cover.

Cable alley shall have sufficient space for aluminium power cables and bottom cable chamber shall be left free completely isolated from the vertical busbar.

Busbars shall have same cross section through out the length. Rating of the neutral busbar shall be 50% of the main busbar. Earth bus bar shall run in bottom chamber throughout the length of the panel.

The number of PDBs/ACDBs and their locations shall be decided based on consumer and shall be finalized during drawing approval stage.

20% of the total feeders shall be kept as spares.

04.06.00

DC Distribution Boards(220V)

For feeding the 220V DC loads, the DCDBs shall be provided.

DCDBs shall have two incomers and a bus section with suitable interlock (one out of two logic) between the two incomers. Incomers of DCDBs shall be breaker operated and outgoing shall be switch fuse modules/MCCB modules. They shall be fixed type and floor mounted. Other constructional features shall be similar to ACDB.

The switch boards shall be provided with suitable quantity and type of outgoing feeders for the auxiliaries, control supplies to various panels / systems. For each load and auxiliary, one separate feeder shall be provided.

The feeder rating and quantity shall be as per requirement.

20% of the total feeders shall be kept as spares.

The continuous current rating of the bus bars and incomers for 220V & 24V DCDBs shall be the maximum DC load (excluding the momentary load) on the bus plus 20% margin rounded off to the next higher standard rating.

04.07.00

AC Distribution panels

AC Distribution panels, shall have switch fuse units as incomer. Distribution panels may be fed from DBs and shall have two incomer. AC distribution Boards shall be of two types - one with 415V, 4-wire, triple pole-and-neutral (TPN) outgoing feeders and the other with 240V, 2- wire, single-pole-and-neutral outgoing feeders. The board shall be wall mounted

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type and other constructional features as given in above specification for PDB/ACDB except that fixed type module are accepted for such DBs.

For small loads, MCB boards with TPN MCB as incomer and TPN/SP MCBs for outgoing may be considered. However, to bring down the short circuit level to safe limits, isolation transformer shall be provided wherever necessary. Details of such loads shall be finalized in consultation with the owner/consultant.

The feeder rating and quantity shall be as per requirement.

20% of the total feeders shall be kept as spares.

04.08.00

A.C. Starter (Contactors)

- a) The contactors shall be three pole, air break type with non-bouncing silver/silver alloy contacts. The contactor shall be designed for duty as per Annexure-B attached.
- b) Each contactor shall be provided with minimum (2) normally open and two (2) normally closed auxiliary contacts rated 10A at 240V A.C. The exact requirement of contacts shall be decided by the bidder taking into account the scheme requirements and spares.
- c) Contactors for forward and reverse direction of reversible drives shall preferably be both electrically and mechanically interlocked.
- d) Delayed dropout contactors, if required and provided for some essential auxiliaries, shall not dropout on power failure if the voltage is restored within three seconds.
- e) It shall be the responsibility of the Bidder to fully coordinate the overload and short circuit tripping of the circuit breakers with the upstream and downstream circuit breakers / fuses / motor starters, to provide satisfactory discrimination. Further the various equipment supplied shall meet the requirements of Type II class of Co-ordination as per IS: 8544..
- f) Contactors shall break without damage 10 times rated current up to 100 amp rating and 8 times rated current for above 100 amp rating.
- g) Continuous current shall not exceed 2 amp and initial pick up shall be limited to 9 amp. Class of insulation shall be E or better.
- h) Bidder shall not drop at 70% but its should definitely drop at 20% of rated volatge.and pick up shall be 85 to 110%. Contactor duty shall be as per requirement.
- i) Coil shall be designed for the control voltage without economy resistors.

04.09.00

DC Starter Panels General

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DC starter panel for Control of DC motors shall be provided. DC starters shall be complete with switch-fuse units, DC contactors, resistors, overload relays, meters, push-buttons, lamps, etc.

DC contactor shall be provided with adequately rated magnetic blow out coil for effective arc quenching.

DC resistance in suitable step shall be provided.

Contactors DC2 for shunt motor, DC4 for series motors.

Required shunt for current measurement.

DC shunt cable used in DCDB, DC starter panels etc. shall be included

Necessary transducers shall be provided for taking current signal to the DCS.

Starters shall be furnished in totally enclosed floor-mounting, sheet steel cubicles complete with a hinged front access door. Minimum thickness of sheet steel shall be 2mm.

The cubicle enclosure shall provide dust and humidity protection, the degree of protection being not less than IP-54.

The resistor enclosure shall be provided with ventilating louvers and wire mesh guard and shall have a degree of protection IP-23.

Cubicle space heater shall be provided to maintain internal temperature above dew point. Heater shall be furnished with switch-fuse unit and thermostat control.

04.10.00 **Requirements for the switchboard components**

04.10.01 **Switches**

Switches shall be triple/double pole, air break type and designed for duties as specified in Annexure-B. Motor duty switches shall be capable of safely making and breaking the locked rotor current of the associated motor circuit.

The switch shall have a quick-make, quick-break mechanism operated by a suitable external handle, complete with position indicator. This handle shall have provision for padlocking in ON and OFF position.

The compartment door shall be interlocked mechanically with the switch such that the door cannot be opened unless the switch is in OFF position. Means shall be provided for releasing this interlock at any time.

Switches shall be capable of withstanding the let-through fault current of back-up fuses or circuit breakers.

Wherever two incoming switches and one bus-section switch/breaker are provided for an assembly, these shall be mechanically/key interlocked to ensure that only two out of the three can be closed at time.

Wherever two incoming switches are provided for an assembly, these shall be mechanically/key interlocked to ensure that one of the two can be closed at time.

04.10.02 **Fuses**

Fuses shall be HRC, cartiridge link type, with a minimum interrupting capacity equal to the short circuit current of the LT system.

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Fuses shall be furnished complete with fuse bases and fittings of such design as to permit easy and safe replacement of fuse element.

Visible indication shall be provided on blowing of the fuse.

Motor fuse characteristics and ratings shall be chosen to ride over starting period without blowing. The fuse on incoming feeder wherever provided, shall be chosen to provide discrimination with motor/feeder fuses.

04.10.03 **Meters and Meter Selector Switches**

All indicating instruments (96 x 96 mm) shall be flush mounted on panel front, with 90 Deg. scale, anti-glare glass and accuracy class of 2. Each meter shall have zero adjuster on the front.

Where Numerical Relays are not envisaged, Ammeters shall be provided for motor feeders of rating above 30 KW. Motor ammeters shall have an extended suppressed end-scale range to indicate starting current (6 to 8 times full-load current).

Meter selector switches shall be maintained contact, stay-put type, with knob handle. Ammeter and voltmeter selector switches shall be four position type. Ammeter selector switches shall have made before break contacts, to prevent open circuiting of CT secondary.

Incomers, Bus PT & Line PT shall have Ammeters & Voltmeters (as applicable) with selector switches in addition to metering in Numerical Relays. Metering for all other feeders shall be through Numerical Relays.

04.10.04 **Transducer(Wherever Numerical relays are not envisaged)**

Feeders requiring remote metering and/or current monitoring shall be provided with solid state current transducers with calibration for full scale reading. The dual output shall be 4-20 mA DC of which shall correspond to the normal range. Transducers shall be duplex type.

04.10.05 **Thermal Overload**

- a) Thermal overload relays shall be three element, positive acting, ambient temperature compensated with adjustable settings.
- b) Single phasing preventor shall be provided as an inbuilt feature of the thermal overload relay.
- c) Relays shall be manual reset type with changeover contacts, Resetting of relays shall be possible with compartment door closed. Colour of the resetting button shall be BLACK.
- d) Relays may be direct acting or C.T. operated, depending on current rating. C.T.s shall be included in the scope of supply. C.T. operated relays shall be used for L.T. Motors having rating 45 KW and above.
- e) Relays for fan motors having long starting time shall be saturable case C.T operated.

04.10.06 **Secondary Wiring**

All boards shall be fully wired at the factory to ensure proper functioning of control, protection, transfer and interlocking schemes.

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Fuse and links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches and other devices shall be wired up to terminal blocks.

Wiring shall be done with flexible, 660 V grade, PVC insulated switchboard wires with stranded copper conductors of 2.5 mm² for current and voltage circuits and 1.5 sq.mm for other circuits..

Each wire shall be ferruled by plastic tube with indelliable ink print at both end having terminal block no., terminal nos, destination no. as per approved Drawing.

Wire terminations shall be made with crimping type connectors with solderless insulating sleeves. Wires shall not be spliced between terminals.

04.10.08 **Terminal Blocks**

Terminal blocks shall be 650V grade clip-on type with marking strips. Terminals for C.T. secondary leads shall have provision for shorting.

Terminal blocks used for interface with DCS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.

Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished.

Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

04.10.09 **Cable Termination**

Generally, all assemblies shall be designed for cable entry from the bottom. Sufficient space shall be provided for all the cables as per cable schedule, for ease of termination and connection.

All provisions and accessories shall be furnished for termination and connection of cables as per cable schedule, including removable gland plates, cable support, crimp type tinned copper lugs, double compression brass glands with tapered washer (Power cable only) and terminal blocks.

Gland plates shall be minimum 3 mm thick. The gland plate and supporting arrangement for single core power cables shall be non-magnetic type to minimise the flow of eddy current.

04.10.10 **Bus Duct Connection**

Bus duct connection, wherever provided, shall be furnished along with transition panel, if required. Bus duct connections shall be from the top.

All connecting bus work shall have the same continuous rating as associated PCC/MCC/DB bus and shall be fully braced for the LT system short circuit current.

All provisions such as matching flanges and other accessories required for proper connection to bus duct shall also be supplied.

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04.10.11 **Ground Bus**

A ground bus, rated to carry maximum fault current, shall be provided which shall extend the full length of the assembly.

The ground bus shall be provided with two-bolt drilling with G.I. bolts and nuts at each end and shall be suitable to receive 50 x 6 mm G.S. flat.

All stationary units shall be directly connected to the ground bus for effective grounding.

The frames of all circuit breakers and drawout V.T. units shall be grounded through heavy multiple contracts at all times except when the primary disconnecting devices are separated by a safe distance.

The frames of all other drawout modules shall be grounded at all times except when the power disconnects are separated by a safe distance.

Wherever the schematic diagrams indicate a definite ground at the switchgear; a single wire for each circuit thus grounded shall be run independently to the ground bus and connected thereto.

C.T. & V.T. secondary neutrals shall be earthed through removable links so that earth of one circuit may be removed without disturbing others.

All hinged doors shall be earthed by flexible copper braid.

04.10.12 **Nameplates**

Nameplates of approved design shall be provided on each cubicle, at the top of the assembly and on each instrument & device mounted on or inside the cubicle.

The material shall be lamicoid or approved equal. 3 mm thick with white letters on black background.

The name plates shall be held by self-tapping screws. Name plate size shall be minimum 20 x 75 mm for instrument/devices & 40 x 50 mm for panels.

Caution notice on suitable metal plate shall be affixed both at the front and back of each vertical panel.

04.10.13 **Space Heaters and Plug Sockets**

Each vertical section shall be provided with thermostat controlled space heater and 5A, 3 pin plug socket.

In addition, motor feeders rated 30 KW and above shall be wired-up for feeding the motor space heater through suitably rated breaker auxiliary NC contact and/or contactor.

Cubicle heater. Motor heater, and Plug-socket circuit shall have individual switch fuse units.

04.10.14 **Current Transformer**

The thermal and dynamic stability current of CTs shall be same as for ACB. CT ratio shall be as per requirement. CT shall be bar/window type conforming to IS-2705, Part-II&III-1992. Current Transformers shall be cast-resin type. All

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secondary connections shall be brought out to terminal blocks where wye or delta connection shall be made.

Accuracy class of the current transformers shall be:

- a) Class PS for differential
- b) Class 5P20 for other relaying
- c) Class 1.0 for metering

Other CT particulars like ratio, burden knee-point voltage, excitation current and secondary resistance shall be decided by the bidder.

Feeders requiring remote metering and/or current monitoring shall be provided with current transducers with calibration for full scale reading, where numerical relays are not envisaged. The output shall be 4-20 mA DC of which shall correspond to the normal range.

CT secondary shall be rated for 1 A for metering & protection.

04.10.15

Voltage Transformer

Voltage transformers shall be cast-resin and shall have an accuracy class of 0.5. Voltage transformer mounted on breaker carriage is not acceptable.

High voltage windings of voltage transformer shall be protected by current limiting fuses.

Low voltage fuses, sized to prevent overload shall be installed in all ungrounded secondary leads. Fuses shall be suitably located to permit easy replacement while the switchgear is energised.

Line PTs and Bus PTs with synchro check facility shall be provided for Incomers. Two sections of the PCC / MCC shall be suitable for momentary parallel operation. Paralleling shall be done through use of synchro check relay.

05.00.00

TESTS

- (a.) All equipments to be supplied shall be of type tested design. The Bidder shall submit for owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.
- (b.) In case the Bidder is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests under this contract at no additional cost either at third party lab or in presence of client/owner's representative and submit the reports for approval.
- (c.) All routine tests as per the specification and relevant standards shall be carried out.

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The following type test certificates on each type & rating of L.T. Switchgear and MCC panel shall be submitted.

- 1) Switchgear / MCC panels of each rating
 - a) Short time withstand test.
 - b) Temperature rise test.
 - c) Degree of protection test
- 2) Circuit breaker of each rating
 - a) Test sequence 1
 - Dielectric properties.
 - Mechanical operation and operational performance capability
 - Verification of dielectric withstand.
 - Verification of temperature-rise
 - b) Combined test sequence (With Circuit breakers mounted inside the Switchgear panel)
 - Rated short-time withstand current
 - Rated service short-circuit breaking capacity
 - Verification of dielectric withstand
 - Verification of temperature-rise
- 3) MCC modules of any three ratings, as selected by the owner, for class – II protection Co-ordination.
- 4) Test for single phasing protection feature on 3 nos. bimetallic thermal overload relay selected by owner. The relay shall be tested for compliance with manufacturer's printed / declared characteristic curve.
 For the following equipment the bidder shall submit the reports of all the type tests as per applicable standards and carried out within last ten years from the date of bid opening. These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. In case the Bidder is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owner's representative and submit the reports for approval.
 - (a.) NUMERICAL RELAYS
 - (b.) ETHERNET SWITCHES
 - (c.) FIBRE OPTIC CABLE
 - (d.) LOCAL PUSH BUTTON STATION
 - (e.) LOCAL MOTOR STARTER
 - (f.) LIGHTING / WELDING TRANSFORMER
 - (g) MCCB

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Type test reports for the following tests on the model of the Numerical relays, Ethernet switches shall be submitted for owner's review.

Test Specification

- 1 Functional requirements
 - a) Features and logics IEC61850
 - b) Checking of compatibility with co-operating devices IEC61850
 - c) Communication IEC61850
- 2 Mechanical construction requirements
 - a) General inspection Manufacturer's document
 - b) Inspection of marking and data IEC 60255-6
 - c) Clearances and creepage distances IEC 60255-5
 - d) Degree of protection by enclosure IEC 60529
- 3 Insulation requirements
 - a) Dielectric test IEC 60255-5
 - b) Impulse voltage test IEC 60255-5
 - c) Insulation resistance measurements IEC 60255-5
- 4 Accuracy requirements
 - a) Measurement accuracy of characteristic quantity and specified time IEC 60255-6
 - b) Limits of frequency range and frequency dependence IEC 60255-6
 - c) Limits of ambient temperature and ambient temperature dependence IEC 60255-6
 - d) Limits of operative range of auxiliary energizing inputs and auxiliary voltage dependence IEC 60255-6
- 5 Rated burden requirements
 - a) Measuring circuits IEC 60255-6
 - b) Auxiliary circuits IEC 60255-6
 - c) Signalling inputs IEC 60255-6
- 6 Thermal requirements
 - a) Temperature rise IEC 60255-6
 - b) Limiting continuous thermal withstand values IEC 60255-6
 - c) Limiting short-time thermal withstand values IEC 60255-6
- 7 Limiting dynamic value requirements IEC 60255-6
- 8 Power supply requirements
 - a) Limiting duration of interruptions to dc auxiliary voltage IEC 60255-11
 - b) Limiting value of ripple in dc auxiliary voltage IEC 60255-11
 - c) Limiting value of voltage dips to ac auxiliary voltage IEC 61000-4-11
 - d) Limiting duration of interruptions to ac auxiliary voltage IEC 61000-4-11
 - e) Limiting variations of ac auxiliary voltage IEC 61000-4-11
- 9 Electromagnetic compatibility requirements

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- a) High frequency disturbance test IEC 60255-22-1
 - b) Electrostatic discharge test IEC 60255-22-2, 61000-4-2
 - c) Radiated, radio-frequency, electromagnetic field immunity test IEC 60255-22-3, 61000-4-3
 - d) Fast transient disturbance test IEC 60255-22-4, 61000-4-4
 - e) Surge immunity test IEC 60255-22-5, 61000-4-5
 - f) Immunity to conducted disturbances, induced by radio-frequency fields IEC 60255-22-6, 61000-4-6
 - g) Power frequency immunity test IEC 60255-22-7
 - h) Conducted and Radiated radio-frequency emission tests IEC 60255-25, EN55011-CISPR 11
 - i) Power frequency magnetic field immunity test IEC 61000-4-8
- 10 Environmental requirements
- a) Dry cold test IEC 60068-2-1
 - b) Dry heat test IEC 60068-2-2
 - c) Storage temperature test IEC 60068-2-8
 - d) Damp heat test, cyclic (12 + 12 hour cycle) IEC 60068-2-30
- 11 Contact performance requirements
- a) Make and carry for dc IEC 60255-23
 - b) Breaking capacity for dc IEC 60255-23
 - c) Make and break ac IEC 60255-23
- 12 Mechanical performance requirements
- a) Durability of relay operation IEC 60255-6
 - b) Durability of plug-in relays IEC 60255-6
 - c) Durability of relay setting controls IEC 60255-6
 - d) Vibration response and endurance test IEC 60255-21-1
 - e) Shock response and withstand test IEC 60255-21-2
 - f) Bump test IEC 60255-21-2

All routine tests as per the specification and relevant standard IS 8623 shall be carried out. An indicative lists of tests / checks is mentioned as QA chapter. However, the manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents. All procedures for type tests shall be approved by owner before commencement of type tests. However, the following points may be specifically noted.

- 1) For temperature rise tests, the connection arrangement between the source and the test equipment shall be such that the temperature gradient in the connection piece of cable at a distance of one meter away from the test equipment shall be restricted to 5 deg C.
- 2) Milli Volt drop test shall be done on switching devices before and after the type tests.
- 3) Bolt tightness of busbar joints shall be checked with torque wrench before and after short time rating tests on the circuit breaker and MCC panels.

Routine checking to observe compliance to degree of protection, first numeral, on switchboard enclosures and busbar chambers shall be as under:

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- 1) IP -4 X It shall not be possible to insert a one mm dia. Steel wire into the enclosure from any direction, without using force.
- 2) IP-5X It shall not be possible to insert a thin sheet of paper under gaskets and through enclosure joints.

ERECTION / INSTALLATION OF SWITCHBOARDS AND OTHER EQUIPMENTS

Each equipment shall be installed in a neat, workman-like manner so that it is leveled, plumbed, squared and properly aligned and oriented. Tolerances shall be as established in Bidder's drawings or as stipulated by owner. No equipment shall be permanently fixed down to foundations until the alignment has been checked and found acceptable by the owner.

Bidder shall furnish all supervision, labour, tools, equipment, rigging materials, bolts, wedges, anchors, etc., in proper time, required to completely install, test and commission the equipment. Manufacturer's and owner's instructions and recommendations shall be correctly followed in handling, setting, testing and commissioning of all equipment.

Bidder shall move all equipment into the respective rooms through the regular door or openings specifically provided for this purpose. No part of the structure shall be utilised to lift or erect any equipment without prior permission of Engineer.

All switchboards shall be installed in accordance with Indian Standard, IS: 3072, and owner's instructions. Switchboard panels shall be installed on concrete floor or supported on steel channel / edge angle in concrete trenches. The Bidder shall provide steel insert plates in the concrete floor and / or steel channels / edge angle on the trenches as applicable. The base frame of switchboards shall be welded to the insert plates by the Bidder. The Bidder shall be required to install and align the panels using suitable metallic shims before welding the base frame. In joining shipping sections of switchboards together, adjacent housing of panel sections or flanged throat sections shall be bolted together after alignment has been completed.

Bidder shall take utmost care in handling instruments, relays and other delicate mechanisms. Wherever the instruments and relays are supplied separately they shall be mounted only after the associated panels have been erected and aligned. the blocking materials employed for safe transit of instruments and relays shall be removed after ensuring that panels have been completely installed and no further movement of the same would be necessary. Any damage shall be immediately reported to Engineer.

Equipment furnished with finished coats of paint shall be touched up by Bidder. if their surface is spoiled or marred during erection / commissioning.

The room and floor finishing work would be done after erection of the panels and the Bidder shall suitably cover up the panels to protect them from injury and marring of finish.

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COMMISSIONING CHECKS / TESTS

After installation of panels, power and control wiring and connections, Bidder shall perform operational tests on all switchboards, to verify proper operation of switchboards /panels and correctness of all equipment in each and every respect. The Bidder shall carry out the following commissioning checks, in addition to other checks and tests recommended by the manufacturers.

GENERAL

- (a.) Check name plate details according to the approved drawings.
- (b.) Check for physical damage.
- (c.) Check tightness of all bolted connections, by torque wrench.
- (d.) Check earth connections.
- (e.) Check cleanliness.
- (f.) Check all moving parts for proper lubrication.

Circuit Breakers

- (a.) Check alignment of breaker truck for free movement.
- (b.) Check correct operation of shutters.
- (c.) Check control wiring for correctness of connections, continuity And IR values.
- (d.) Manual operation of breakers completely assembled.
- (e.) Closing /opening operation, manually and electrically.
- (f.) Trip free and anti-pumping operation.
- (g.) I.R. values of contacts.
- (h.) Contact resistance.
- (i.) Check on spring charging motor, correct operation of limit switches and time or charging.
- (j.) All functional checks
- (k.) Breaker closing and tripping time, if required.

Current Transformers

- (a.) Visual inspection.
 - (b.) IR Value
 - (c.) Ratio check.
 - (d.) Magnetising current.
 - (e.) Wiring connection.
 - (f.) Spare CT cores, if any, to be shorted and earthed
- Voltage Transformers**
- (a.) Visual inspection.
 - (b.) IR Value
 - (c.) Ratio check
 - (d.) Magnetising current
 - (e.) Line connection as per connection diagram

Cubicle Wiring

- (a.) Check all switch developments

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- (b.) Each wire shall be traced by continuity tests and it shall be ensured that the wiring is as per relevant drawing. All inter-connections between panels / equipment shall be similarly checked.
- (c.) All the wires shall be meggered to earth.
- (d.) Functional checking of all control circuit e.g., closing, tripping, control, interlock, supervision and alarm circuit.

Relays

1. Check connections and wiring.
2. Megger
 - a) Megger all terminals to body.
 - b) Megger AC to DC terminals.
3. Check operating characteristics by secondary injection.
4. Check minimum pick up voltage of DC coils.
5. Check operation of electrical / mechanical targets.
6. Relay settings.
7. Check CT and VT connections with particular reference to their polarities.

Meters

- (a.) Visual inspection.
- (b.) Megger all insulated partitions.
- (c.) Check CT and VT connections with particular reference to their polarities for power type meters.
- (d.) Calibration.

06.00.00 **DRAWINGS, DATA & MANUALS**

06.01.00 Drawings, data & manuals to be submitted as indicated below

- a) General arrangement and cross-sectional drawings showing constructional features, space required in front for withdrawals, power & control cable entry points etc.
- b) Bill of Materials
- c) Typical foundation plans
- d) Board-wise single line diagrams.
- e) Typical control schematics
- f) Drawings of matching flanges and terminals for bus termination
- g) Calculation for selection of CT and VT rating
- h) Bus bar sizing calculation
- i) Reports for all type tests of representative sections of panel assemblies.
- j) Technical Data sheets (in specification format)
- k) Technical leaflets

06.02.00 To be submitted after Award of Contract

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- a) Outline dimensional drawings showings general arrangement, space requirements and bus duct/cable entry points.
- b) Cross-section with parts list
- c) Foundation plan & loading
- d) Board-wise single line diagrams
- e) Control schematics
- f) Wiring diagrams
- g) Consolidated Bill of Material
- h) Relay setting calculation.
- i) Test Certificates and QAP
- j) Bus bar sizing
- k) CT/VT sizing
- l) Technical leaflets
- m) Technical Data Sheets (in specification format)

06.03.00 The bidder shall also submit all instruction manuals clearly indicating the installation method, check-up and tests that are to be carried out before commissioning the equipment.

06.04.00 Bidder shall note that the drawings, data and manuals listed herein are minimum requirements only. The bidder shall ensure that other necessary write-ups, curves and information required to fully describe the equipment are submitted .

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07.00.00

Ratings & Requirements

415V switchgears shall comply with the particulars indicated in the following table:

SL NO.	DESCRIPTION	SPECIFICATION REQUIREMENTS	
(a)	Rated voltage, phases and frequency	415V, 3 phase, 4 wire, 50 Hz.	
(c)	System neutral earthing	Solidly earthed	
(b)	Reference Ambient air temperature	50°C	
(d)	Material of bus bars	High conductivity Al. Alloy / copper	
(e)	Maximum temp. of bus bars joints, droppers and along the run at site reference ambient of 50°C	40°C	
(f)	Short time rating for 1.0 Sec. (kA rms)	50	
(g)	Momentary rating (kA peak)	105	
(h)	Degree of protection for as per IS:2147	IP-52	
(i)	Thickness of sheet steel in mm		
	(i) Load bearing members	2.0	
	(ii) Non-load bearing members	1.6	
(j)	Colour finish shade as per IS :5	Interior	Glossy white
		Exterior	Finishing paint shade for complete panels excluding end covers shall be RAL9002 & RAL5012 for extreme end covers of all boards, unless required otherwise by the owner. The paint thickness shall not be less than 50 microns.

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Air Circuit Breaker

1.	Service	:	Indoor
2.	Type	:	Air – break
3.	Rated service voltage	:	415 v $\pm$ 10%
4.	Rated Current	:	As per requirement
5.	Rated frequency	:	50 Hz $\pm$ 5%
6.	System earthing	:	Solidly grounded
7.	Rated short time withstand current for 1 sec.	:	50 KA (r.m.s.)
8.	Rated Symmetrical breaking current at rated voltage	:	50 KA (r.m.s.)
9.	Rated making capacity (min)	:	105 KA
10.	Rated operating duty	:	The duty of circuit breaker for motor feeder involves direct-on- line starting of motors. The motor starting current varies from 6 to 8 times the full load current at a very low power factor
11.	Duty cycle	:	O-3 min-CO-3 min-CO
12.	Operating mechanism	:	Stored energy type
	a) Closing	:	motor wound spring operated
	b) Opening	:	shunt trip coil
	c) Latching arrangement	:	Mechanically & Electrically trip free
13)	Auxiliary Voltage	:	
	Closing	:	220V D.C. (85% - 110%)
	Tripping	:	220V D.C. (70% - 110%)
	Spring charging motor	:	220 V $\pm$ 10% D.C.
	Space heater & lamp	:	240 V $\pm$ 10% AC 50 Hz
14.	Anti-pumping feature	:	Electrical anti-pumping feature shall be provided.
15.	No. of poles	:	3
16.	Aux. Switch contact (as per requirement)	:	Min (6 NO + 6 NC)
17.	Mounting	:	Drawout type transfer truck within switchgear cubicle
18.	Limits of temp. rise	:	As per IS:2516 part I & II / Sec I
19.	Termination	:	
	Incomer	:	Cable or Busduct (top or bottom)
	Outgoing	:	Cable
20.	Static built in release	:	To be provided
21.	Finish paint	:	Finishing paint shade for complete panels excluding end covers shall be RAL9002 & RAL5012 for extreme end covers of all boards, unless required otherwise by the owner. The paint thickness shall not be less than 50 microns.
	HRC FUSES	:	
	Type	:	HRC cartridge type link fuse
	Reference standard	:	IS : 13703

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	Rated current	:	As specified	
	Operation indicator	:	Required	
	Fuse characteristics	:	Bidder to furnish	
	CONTACTOR	:	AC	DC
1.	Service	:	Indoor within steel cubicle for maximum system voltage, starting of motors and miscellaneous loads.	Indoor within steel cubicle for maximum system voltage, starting of motors and miscellaneous loads.
2.	No. of Poles	:	3	2
3.	Rated service voltage	:	415 V $\pm$ 10%	220 V(190-240V)
4.	Rated frequency	:	50 Hz $\pm$ 5%	
5.	System earthing	:	Solidly grounded	ungrounded
6.	Short time rating	:	To be coordinated with fuse Preceding it.	To be coordinated with fuse Preceding it.
7.	Continuous current	:	To suit motor continuous current rating Conditions specified.	To suit motor continuous current rating Conditions specified.
8.	Short circuit level	:	50 KA (rms) at 415 V	20 KA at 220V
9.	Control circuit	:	110V $\pm$ 10% 1-ph 50 Hz $\pm$ 5% derived from 415/110V control transformer provided in 2x100% in each bus section	220V tapped from power circuit.
10.	Utilisation category	:	AC 3 for uni- directional motors AC 4 for Bi-directional Motors.	DC 2 for shunt motors DC 4 for series motors.
11.	Duty Class: Intermittent class for Uni-directional motors (IS:2959)	:	0.1	0.1
	Intermittent class for Bi-directional motors (IS:2959)	:	0.3	-
12.	Aux. Contact requirement	:	Min. 2 NO & 2 NC contacts	Min. 2 NO & 2 NC contacts
13.	Limits of operation	:		

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	Closing (pick-up)	:	85% to 110%	DC operated contactor coil shall have an economy resistor and shall be suitable for satisfactory continuous operation at 187-242 V DC/ 93.5-121 V
	Dropout	:	The contactor shall not drop out at 70% of the rated voltage but shall definitely drop out at 20% of the rated voltage.	The contactor shall not drop out at 70% of the rated voltage but shall definitely drop out at 20% of the rated voltage.
14.	High voltage test values (one Min. value)	:		
	a. Main power circuit	:	2.5 KV	1.5 KV
	b. Control & auxiliary circuit volts	:	2.0 KV	1.5 KV
15.	Limits of temperature	:	As per IS:2959	As per IS:2959
	CURRENT TRANSFORMERS	:		
1.	Service	:	Indoor	
2.	System	:	415V, 3 phase, 4 wire, 50Hz, Solidly earthed neutral Solidly earthed neutral	
3.	Type	:	Resin cast	
4.	Rated voltage	:	415 V +10%	
5.	Quantity required	:	As per requirements of individual feeders and as mentioned in the specification drawings.	
6.	Ratio and burden	:	As required, C.T. secondary rating shall be 1 AMP.	
7.	Accuracy	:	5P10 or better for protection and class-1 for metering.	
8.	Power frequency withstand voltage	:	2.5 KV (r.m.s) for one minute	
9.	Rated short time current	:		
	Short time withstand current for 1 sec	:	50 KA (r.m.s)	
	Dynamic current	:	105 KA (peak)	
10.	Mounting	:	Inside switchgear cubicle in stationary portion.	
	Potential Transformer	:		
1.	Service	:	Indoor	

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2.	System	:	451V, 3 phase, 4 wire, 50 Hz, Solidly earthed neutral
3.	Type	:	Cast resin
4.	Rating- Voltage ratio	:	415/ $\sqrt{3}$ / 110/ $\sqrt{3}$
5.	Rated burden	:	As specified
6.	Accuracy class	:	As per requirement
7.	Power frequency withstand voltage	:	Primary: 3.0 KV for one minute Secondary : 2.0 KV for one minute
8.	Mounting	:	Fixed type
9.	Quantity	:	As per requirement

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08.00.00 Microprocessor based numerical relays with communication facility

The numerical relays for 0.415KV Switchgears shall comply with but not limited to the following technical requirements.

1	Purpose	:	Protection, Metering and Monitoring of all switchgears and MCCs with synchro check facility for Incomers, Bus couplers.
2	Auxiliary Supply	:	220V DC for ACBs and 110V AC for MCC only.
3	CT Secondary Current	:	1Amp.
4	PT Secondary Voltage	:	110V AC, 3 Phase
5	Ambient Temperature	:	50°C
6	Degree of protection	:	IP 54
7	Communication	:	Compatible with DCS/PLC system through suitable connectivity & suitable software.
8	Input & Output	:	Required number of analog and digital inputs/outputs as per scheme requirement with spare.
9	Metering	:	Complete metering for Incomer, Tie, Bus coupler, feeders as indicated.
10	Protection	:	Complete protection for Incomer, Tie, Bus coupler, feeders as indicated.
11	Monitoring	:	Self-diagnostic facility.
12	Facilities to be made available in the relay	:	- Programming keys for complete access with out computer (built in) - Provision for external programming unit through suitable software and communication ports. - Display unit. - Read/Write set points. - Current & Voltage actual values and any other analog measurement. - Event recording with Pre-trip data with starting characteristics. - Statistical data. - Output relays. - Tamper proof security system.

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Annexure – A

Selection of Switches & contactors

Motor Feeders

Type	Motor Rating	Switch Fuse Rating / MCCB	Contactor	Cable size
A	0 - 5.5 KW	32A	16A	3/c – 2.5 Sq.mm - Cu
B	5.6 - 11 KW	63A	32A	3/c - 16 Sq.mm - Al
C	11.1 - 22 KW	63A	63A	3/c - 35 Sq.mm - Al
D	22.1 - 50 KW	100A	100A	3/c - 95 Sq.mm - Al
E	50.1 - 75 KW	200A	160A	3/c - 185 Sq.mm - Al
F	75.1 - 89 KW	400A	300A	2 x 3/c - 185 Sq.mm - Al

NOTE :

1. Rating of Switch Fuse unit, thermal overload relay and Bidder are to be coordinated with motor rating by the bidder.
2. Switch Fuse with E/F protection to be considered for motors above 45 KW.

Outgoing Feeders

Type	Switch Fuse Rating / MCCB	Cable Size
AF	32A	4/c – 16 Sq.mm - Al
BF	63A	4/c – 35 Sq.mm - Al
CF	100A	3.1/2c – 95 Sq.mm - Al
DF	200A	3.1/2c – 300 Sq.mm - Al
EF	400A	4 x 1/c – 630 Sq.mm - Al
FF	630A	7 x 1/c – 630 Sq.mm - Al

Note: Selection of switches, contactors and cable sizes indicated above are for general guidance of the bidder and the exact requirement shall be as per the detail engineering by bidder.

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CHAPTER-8.3

TECHNICAL SPECIFICATION FOR HT & LT SWITCHGEAR PROTECTIONS, CONTROL AND METERING

04.00.00 NUMERICAL RELAYS

04.01.00 General requirements

04.01.01 All numerical relays, auxiliary relays and devices shall be of types, proven for the application; satisfying requirements specified elsewhere and shall be subject to owner's approval. Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the owner.

04.01.02 All relays and timers shall be rated for control supply voltage as mentioned elsewhere under parameters and shall be capable of satisfactory continuous operation between 80-120% of the rated voltage. Making, carrying and breaking current ratings of their contacts shall be adequate for the circuits in which they are used. Interrogation voltage for the binary inputs shall be suitably selected to ensure avoidance of mal operation due to stray voltages.

04.01.03 The protective relays shall have at least 10 Nos potential free contacts (Programmable). Auxiliary relays shall have contacts as required. Relay output contacts shall be suitable for directly wiring in the breaker closing and trip circuit operating from 240 V DC/120V DC control voltage.

04.01.04 Failure of a control or auxiliary supply and deenergisation of a relay shall not initiate any circuit breaker /contactor operation. All relays shall withstand a minimum test voltage of 2 kV AC rms for one minute.

04.01.05 All the numerical relays shall have communications on three ports, local front port communication to laptop and dual ports on IEC 61850 to communicate with the data concentrator through LAN. Preferably, the numerical relays shall be capable of communicating simultaneously on both the redundant rings to enable seamless switchover.

04.01.06 All Numerical relays shall have features for electrical measurement including voltage, current, power (active/reactive) and energy parameters.

04.01.07 Relays shall have separate output for individual functionality and the master trip shall be software configurable in case of multi output relays. Relays shall have event recording feature, recording of abnormalities and operating parameters with time stamping.

Rourkela Power Project (PP – III : 1 x 250 MW) EPC Package	Technical Specification Section – VI, Vol – II-E Bid Doc. No. : CC&M-C-347-211	Chapter – 8.3 Switchgear Protection	Page 1 of 21
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04.01.08 Preferably comprehensive single numerical relay shall have provision of both current and voltage inputs. The current operated relay shall have provision for 4 sets of CT inputs, 3 nos. for phase fault & 1 CT input for earth fault. Relay shall be suitable for both residually connected CT input as well as CBCT input. The Numerical relays in the Incomers shall have at least 5 CT inputs. The voltage operated relay shall have provision for 3 PT inputs. Relays shall be suitable for CT secondary current of 1A / 5A selectable at site. Relays used in incomers, tie and bus couplers shall have provision of two sets of voltage signal inputs for the purpose of synchronization.

04.01.09 All CT & PT terminals shall be provided as fixed type terminals on the relay to avoid any hazard due to loose connection leading to CT opening or any other loose connection. In no circumstances Plug In type connectors shall be used for CT / PT connections. Vendor to ensure the same for all protective relay models offered.

04.01.10 All numerical relay shall have key pad / keys to allow relay setting from relay front. All hand reset relays shall have reset button on the relay front. Relay to be self or hand reset shall be software selectable. Manual resetting shall be possible from remote.

04.01.11 Relays shall have suitable output contact for breaker failure protection.

04.01.12 Relays shall have self diagnostic feature with self check for power failure programmable routines, memory and main CPU failures.

04.01.13 Disturbance Record waveforms, event records & alarms shall be stored in Nonvolatile memory and failure of control supply shall not result in deletion of any of these data.

04.01.14 Relays shall have at least two sets or groups of two different sets of adaptable settings. Relays shall have multiple IEC/ ANSI programmable characteristics.

04.01.15 Design of the relay must be immune to any kind of electromagnetic interference Vendor to submit all related type test reports for the offered model along with the offer. Relays shall be provided with suitable harsh environment coating for protection against failure due to high temperature, humidity and dust.

04.02.00 Protections: Relay Types/ Protections

04.02.01 Motor Feeder Protections

The Motor protection relay shall be suitable for providing the following protections

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1. Thermal Overload Protection (50I)

Relay should have adjustable thermal curve as per motor design or motor parameters. Separate prior alarm with separate settable settings should be available.

2. Restart Inhibit Protection (49)

The offered relay should have separate thermal based restart inhibit feature with separate settable settings. It should be possible to route restart inhibit function to output contact to block closing command during restart inhibit period. Estimation of the time to the next motor restart should be available.

3. Short Circuit Protection (50)

The relay should have short circuit protection to take care of motor inter winding, phase-to-phase and phase-to earth faults. The protection shall have Instantaneous operation. The protection should have feature of blocking of short circuit protection to make relay suitable for contactor controlled motors. The short circuit protection also should have cold load pick up (doubling) feature to allow the lesser short circuit setting for better insulation life of motor while ensuring that relay does not mal operate during starting of motor.

4. Earth Fault Protection (50N/50N2)

The relay should have earth fault protection to take care of earth faults. The protection shall have Instantaneous operation or definite-time characteristic. Relay shall be suitable for both residually connected CT input as well as CBCT input. With CBCT the relay shall be suitable for detection of earth fault currents in the range of 1%. (10 mA). Provision should be provided to block earth fault element in case of phase current exceeding 4 times of full load current when used for contactor controlled motors.

5. Negative Phase Sequence Protection (46)

The relay should have negative phase sequence (unbalance) protection to protect the motor against overheating caused by phase unbalance. The relay should be able to display negative sequence current. The relay also should have single phasing protection.

6. Locked Rotor Protection (50 L/R)

The relay should have locked rotor protection to take care of stalling of motor during motor start up. The protection should take care of the prolonged motor start up time under network low-voltage conditions.

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The relay shall have provision to accept speed switch input to enable to use relay for applications where the safe stall time of motor is shorter than the start-up time of the motor.

7. Number of starts limitation (66)

The relay should have repetitive start protection to protect the motor against overheating caused by too frequent start-up attempts. The output of this function block should be routed to restart inhibit output.

8. Under Voltage protection with timer (27 M)

The relay should have under voltage protection with built in variable timer. The protection should be sensed through bus PT voltage provided to relay.

9. Motor Differential protection (87 M)

Differential protection for motors equal and above 2 MW shall be provided with high stability circulating current relays tuned to system frequency (Harmonic restraint) having pick up setting range of 10 to 40 % of CT secondary. Necessary series stabilizing resistors and metrosils shall also be provided.

10. Circuit-breaker failure protection (50 BF)

Built in circuit breaker failure protection should be available in relay, which should provide a trip signal via backup tripping path when breaker of motor feeder fails to operate and if the fault current still persists. It should be possible to route this protection to separate output contact.

11. Fuse fail protection (60)

Built in fuse fail protection should be available in relay, which should block under voltage protection in the event of fuse fail. The relay should have built in Lockout feature

04.02.03 Protections for Incomers, Bus couplers and Tie feeders.

The Incomer, Bus Coupler & Tie feeder protection relay shall be suitable for providing the following protections

1. Over-current & Earth Fault Protection

The over current element should have the minimum setting adjustable between 250- 2000% of CT secondary rated current.

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The earth fault element should be suitable for residually connected CT input. The relay shall be suitable for detection of earth fault currents in the range of 5% to 10%. The relay should have built in Lockout feature.

2. Synchronizing Check (25)

Synchronizing check feature as a part of manual live change over and dead bus closing feature for dead bus closing shall be provided.

3. Bus No-volt

Bus no volt signal shall be configured in the relay for use in control logics.

04.03.00 Other Protections and Control functions in the Relays.

04.03.01 For Breaker control from DCS, hardwired potential free contacts shall be provided from DCS to the numerical relays. Preferably, no separate coupling relays shall be provided.

04.03.02 Trip circuit supervision shall be provided for all feeders to monitor the circuit breaker / contactor trip circuit both in pre trip and post trip conditions.

04.03.03 Schematics requiring auxiliary relays / timers for protection function shall be a part of numerical relay. The number of auxiliary relay and timer function for protection function shall be as required. Auxiliary relays for interlocking purpose shall be of self reset type.

04.03.04 Bus no volt condition shall be configured to an output contact of the relay of all incomers for suitably interfacing with the DCS.

04.03.05 Timer functions shall be programmable for on / off delays.

04.03.06 The numerical relay shall be able to provide supervisory functions such as trip circuit monitoring, circuit breaker status monitoring, PT and CT supervision and recording facilities with Post fault analysis.

04.03.07 The numerical processor shall be capable of measuring and storing values of a wide range of quantities, all events, faults and disturbance recordings with a time stamping using the internal real time clock. Battery back up for real time clock in the event of power supply failure shall be provided.

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04.03.08 250 time tagged events / records should be able to store with time stamping. Last 5 faults storage including the indication, protection operated , fault location relay and operating time, currents, voltage and time.

04.03.09 Diagnostics Automatic testing, power on diagnostics with continuous monitoring to ensure high degree of reliability shall be shall be provided. The results of the self reset functions shall be stored in battery back memory. Test features such as examination of input quantities, status of digital inputs and relay outputs shall be shall be available on the user interface

04.03.10 The alarm / status of each individual protection function and trip operation shall be communicated to DCS. The numerical relay system shall have built-in features / hardware interface to provide such inputs to DCS for analog / digital values. The provision of receiving the D.C. incoming supplies and its monitoring shall preferably be made in one bus P.T. Panel.

04.03.11 Sequence of events shall have 1 ms resolution at device level.

04.03.12 Measurement accuracy shall be 1 % for rated RMS Current and voltage (20- 120% of Rated primary).

04.03.13 It shall be possible to carryout open / close operation of breakers from a laptop by interfacing from the relay front port during initial commissioning.

04.03.14 The motor modules for PA FAN, FD FAN, ID FAN and MILL MOTORS shall have 4-20 mA analog output (current signal) for use in control logics in DCS. This may be provided as analog output from the Numerical relay or may be generated using a suitable CT & Current transducer. In addition, any other requirement of digital & analog signals for process controls shall be taken care.

04.03.15 Additional Goose Controls shall be configured in the Numerical Relays for following functions. The response time of goose interlocks shall be 5ms.

- a. Inter tripping
- b. Reverse Blocking
- c. Earthing Interlocks

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07.00.00 ETHERNET SWITCHES

Ethernet switches shall be 'substation hardened', and shall comply to IEC61850- 3 for communications and environment requirements. The Ethernet switches shall be of managed type with two (2) No of Fibre optic cable ports and Sixteen / Eight Copper ports to achieve the LAN configuration indicated in the drawings. The Ethernet switches shall have features to support the dual redundant rings as shown in the architecture drawings. These switches shall be mounted inside the switchgear Panels and shall be suitable for accepting dual redundant power supplies. The FO ports shall be Single-mode 1000Mbps ports and copper portsshall be 10/100Mbps ports.

Necessary software for configuration and real-time network monitoring shall be provided along with the Ethernet switches. Network monitoring feature shall be integrated with the SCADA software to provide complete network status on the HMI.

16.00.00 TYPE TESTS AND FACTORY ACCEPTANCE TESTS

16.01.00 Type test reports for the following tests on the model of the relays, Ethernet switches, LAN equipments shall be submitted for owner's review.

Test Specification

1 Functional requirements

- 1 Features and logics IEC61850
- 2 Checking of compatibility with co-operating devices IEC61850
- 3 Communication IEC61850

2 Mechanical construction requirements Manufacturer's document

- 1 General inspection
- 2 Inspection of marking and data IEC 60255-6
- 3 Clearances and creepage distances IEC 60255-5
- 4 Degree of protection by enclosure IEC 60529

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3 Insulation requirements

- 1 Dielectric test IEC 60255-5
- 2 Impulse voltage test IEC 60255-5
- 3 Insulation resistance measurements IEC 60255-5

4 Accuracy requirements

- 1 Measurement accuracy of characteristic quantity and specified time IEC 60255-6
- 2 Limits of frequency range and frequency dependance IEC 60255-6
- 3 Limits of ambient temperature and ambient temperature dependence IEC 60255-6
- 4 Limits of operative range of auxiliary energizing inputs and IEC 60255-6 auxiliary voltage dependence

5 Rated burden requirements

- 1 Measuring circuits IEC 60255-6
- 2 Auxiliary circuits IEC 60255-6
- 3 Signalling inputs IEC 60255-6

6 Thermal requirements

- 1 Temperature rise IEC 60255-6
- 2 Limiting continuous thermal withstand values IEC 60255-6
- 3 Limiting short-time thermal withstand values IEC 60255-6

7 Limiting dynamic value requirements IEC 60255-6

8 Power supply requirements

- 1 Limiting duration of interruptions to dc auxiliary voltage IEC 60255-11
- 2 Limiting value of ripple in dc auxiliary voltage IEC 60255-11
- 3 Limiting value of voltage dips to ac auxiliary voltage IEC 61000-4-11
- 4 Limiting duration of interruptions to ac auxiliary voltage IEC 61000-4-11
- 5 Limiting variations of ac auxiliary voltage IEC 61000-4-11

9 Electromagnetic compatibility requirements

- 1 High frequency disturbance test IEC 60255-22-1
- 2 Electrostatic discharge test IEC 60255-22-2 ,61000-4-2

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- 3 Radiated, radio-frequency, electromagnetic field immunity test IEC 60255-22-3,61000-4-3
- 4 Fast transient disturbance test IEC 60255-22-4,61000-4-4
- 5 Surge immunity test IEC 60255-22-5,61000-4-5
- 6 Immunity to conducted disturbances, induced by radio frequency IEC 60255-22-6 fields 61000-4-6
- 7 Power frequency immunity test IEC 60255-22-7 IEC 60255-25
- 8 Conducted and Radiated radio-frequency emission tests EN55011-CISPR 11
- 9 Power frequency magnetic field immunity test IEC 61000-4-8

10 Environmental requirements

- 1 Dry cold test IEC 60068-2-1
- 2 Dry heat test IEC 60068-2-2
- 3 Storage temperature test IEC 60068-2-8
- 4 Damp heat test, cyclic (12 + 12 hour cycle) IEC 60068-2-30

11 Contact performance requirements

- 1 Make and carry for dc IEC 60255-23
- 2 Breaking capacity for dc IEC 60255-23
- 3 Make and break ac IEC 60255-23

12 Mechanical performance requirements

- 1 Durability of relay operation IEC 60255-6
- 2 Durability of plug-in relays IEC 60255-6
- 3 Durability of relay setting controls IEC 60255-6
- 4 Vibration response and endurance test IEC 60255-21-1
- 5 Shock response and withstand test IEC 60255-21-2
- 6 Bump test IEC 60255-21-2

16.02.00 Factory Acceptance Tests (FAT) & Pre-FAT

16.02.01 Pre-FAT shall be carried out at owner's Engineering Office before the system is cleared for FAT. The pre-FAT shall include verification of the complete configuration of the system with respect to all process displays like single line diagrams, trends, alarms, reports, etc.

16.02.02 Full functionality of the relay including protection /metering to be demonstrated using secondary injection procedures.

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16.02.03 All equipment furnished under this specification shall be subject to test by authorized quality assurance personnel of the bidder and owner's representatives during manufacture, erection and on completion. The approval of the owner or passing such inspections or tests will not, however, prejudice the right of the owner to reject the equipment if it does not comply with the specifications when erected or fails to give complete satisfaction in service.

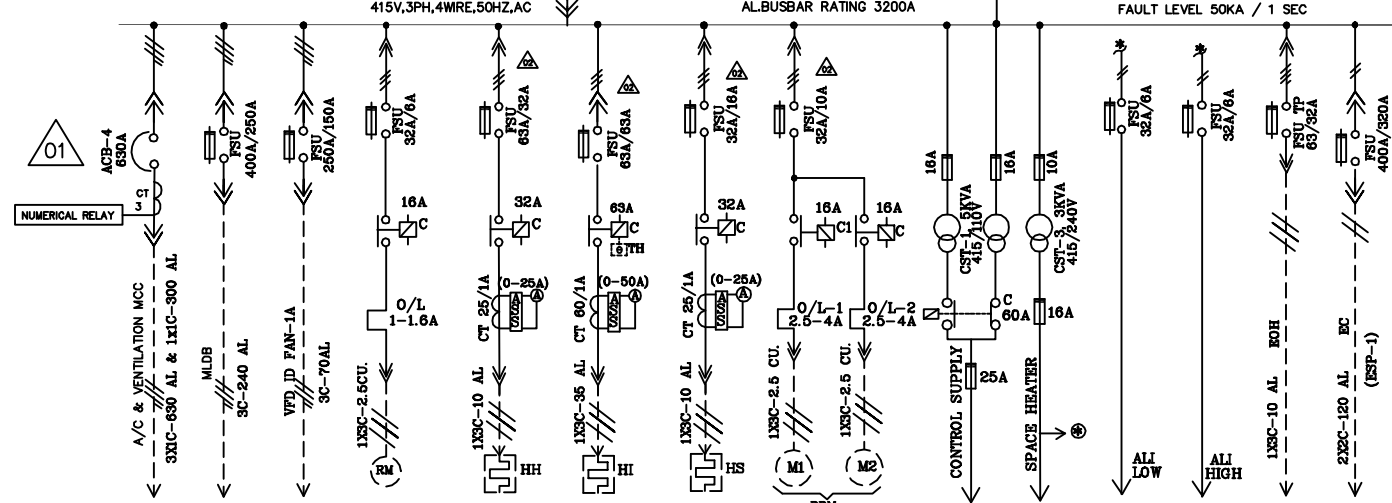
Quality assurance system followed by manufacturer should preferably be in line with IEC 61850 Part 10. However, an indicative requirement of operational and pre-FAT tests as well as FAT test (Integrated Test) is given in this Section.

16.02.04 The FAT shall be mutually agreed upon and approved by owner during detailed engineering. The Factory Acceptance Tests (FAT) shall include all reasonable exercises which the combination of equipment and software can be expected to perform. These tests shall be divided into, as a minimum, but not limited to the following categories:

- Pre power on checks
- Power on checks
- Hardware tests
- Functional tests
- Parametric tests
- Specific tests on electronic hardware
- Power failure auto-restart tests
- Testing of interlocking

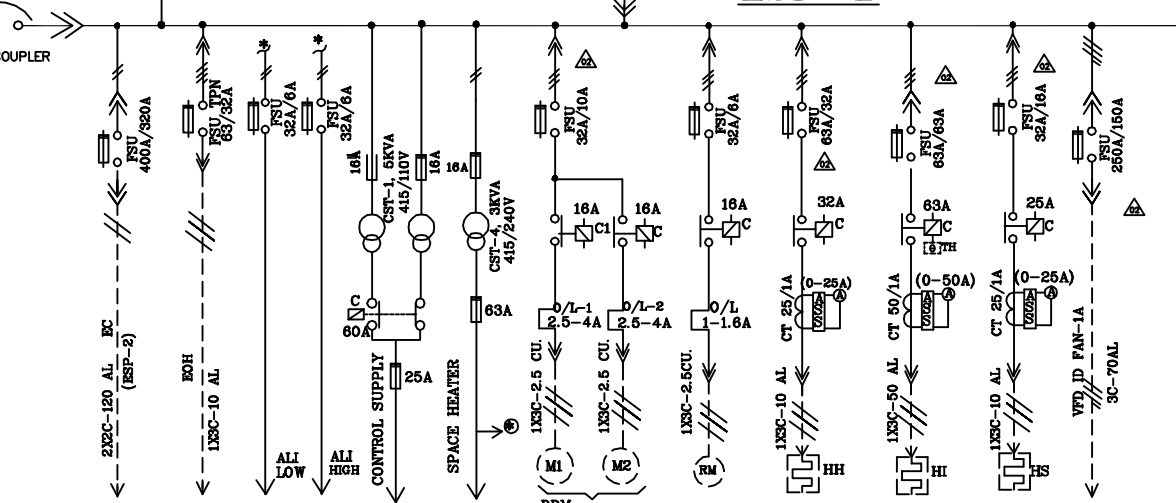
16.02.05 The bidder shall submit a detailed FAT procedure for owner's approval during detailed engineering stage based on the above guidelines. The test results obtained shall be properly documented by the bidder and furnished in the owner's approved format as decided during detailed engineering and submitted in the requisite number of copies with all annex irrespective of the fact that owner's representative was present during the tests.

ESP-A

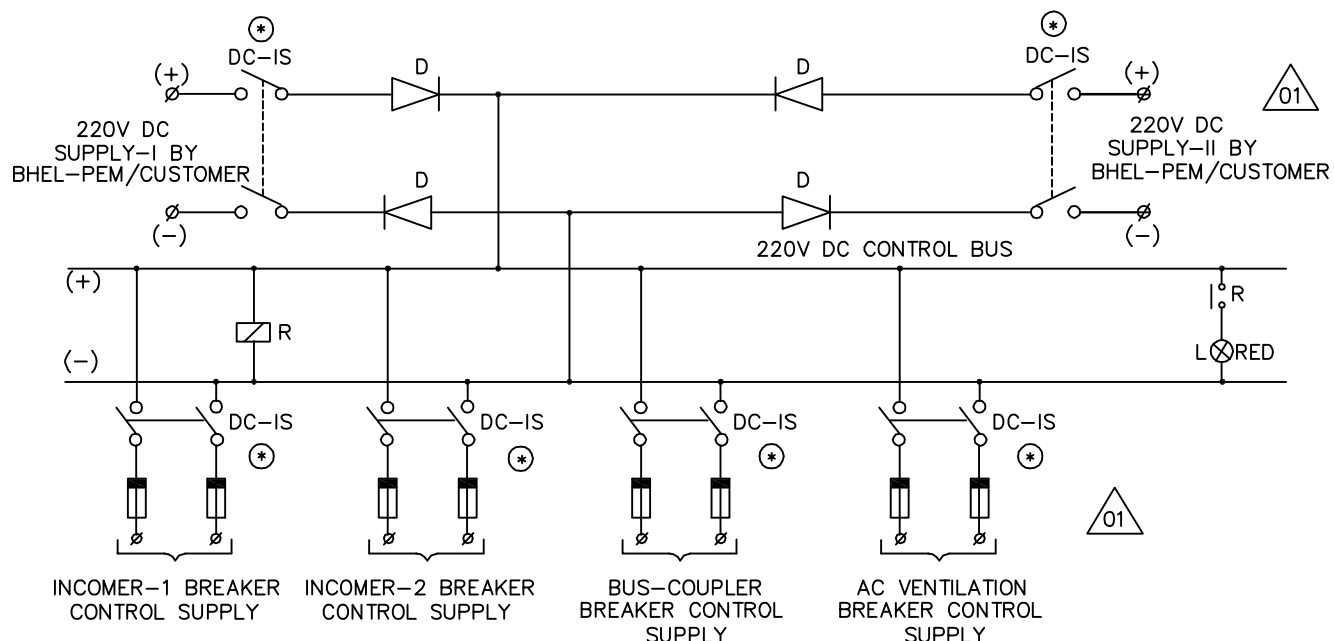


ESPSG	FEEDER RATING	630A	100KVA	20KVA	0.37KW	12KW	28KW	7KW	2X1.1KW	5KVA	3KVA	-	-	-	118KVA
	FULL LOAD CURRENT	-	-	-	0.9A	18A	42A	10.5A	2X1.8A	-	-	-	-	-	245A
ESPSG-1	NO. OF FEEDERS	1	1	1	15+3(SP)	7+2(SP)	1+1(SP)	1+1(SP)	1	1	1	1	1	1	7+2(SP)
ESPSG-2	NO. OF FEEDERS	1	1	1	15+3(SP)	7+2(SP)	1+1(SP)	1+1(SP)	1	1	1	1	1	1	7+2(SP)

ESP-B



ESPSG	FEEDER RATING	630A	100KVA	20KVA	0.37KW	12KW	28KW	7KW	20KVA
	FULL LOAD CURRENT	-	-	-	0.9A	18A	42A	10.5A	-
ESPSG-1	NO. OF FEEDERS	1	1	1	15+3(SP)	7+2(SP)	1+1(SP)	1+1(SP)	1
ESPSG-2	NO. OF FEEDERS	1	1	1	15+3(SP)	7+2(SP)	1+1(SP)	1+1(SP)	1



FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377

भारत भारी इलेक्ट्रिकल्स लिमिटेड
MECON LIMITED

NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE

DEPT CODE M

NAME	SIGN	DATE
DRN S.PRAKASH.	<i>S.P.</i>	13.10.2016
DESN D.SREERAMULU	<i>D.S.</i>	13.10.2016
CHD D.SREERAMULU	<i>D.S.</i>	13.10.2016
APPD M.J.M	<i>M.J.M.</i>	13.10.2016

TITLE: SINGLE LINE DIAGRAM OF ESP SWITCH GEAR PANEL

BHEL/BAP DRG.NO. 3-00-114-39782

SCALE : N.T.S.

SHEET 01 OF 01

REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

NOTE: —

01. CONSTRUCTION : SINGLE FRONT FOR INCOMER AND DOUBLE FRONT FOR OUTGOING FEEDERS.
DRAW OUT FOR INCOMER AND OUTGOING FEEDERS.
02. NO.OF ESP SWITCH GEAR PANEL : TWO NUMBERS PER BOILER . 02
03. ESPSG SHALL BE SUITABLE FOR 3PH, 4WIRE, 415V, 50HZ SUPPLY.
04. ALL POWER, CONTROL SWITCHES AND RESET PUSH BUTTONS SHALL BE MOUNTED ON MODULE DOORS. ALL INSTRUMENTS AND SWITCHES SHALL BE FLUSH MOUNTED.
05. EC FEEDERS SHALL BE DISTRIBUTED BETWEEN RY,YB & BR TO HAVE BALANCED LOAD (DELTA).
06. THE ACB SHALL BE SUITABLE FOR 220V DC CONTROL SUPPLY. BHEL—PEM SHALL PROVIDE 220V DC DUAL CONTROL SUPPLY AT ESPSG
07. THE SPACE HEATER SUPPLY SHALL BE ARRANGED WITHIN THE ESPSG WITH A CHANGE OVER SWITCH SO THAT EITHER OF THE INCOMER SUPPLY CAN BE TAPPED.
08. ALL SPARE CONTACTS SHALL BE WIRED UP TO THE TERMINAL BLOCK.
09. DOUBLE COMPRESSION TYPE BRASS CABLE GLANDS AND HEAVY DUTY ANNEALED TINNED COPPER(ATC) LUGS ARE ENVISAGED FOR ALL MODULES AND THE SAME SHALL BE SUPPLIED BY THE ESPSG PANEL MANUFACTURER, FOR ALL EXTERNAL CABLES.
10. THE INCOMERS SHALL BE LOCATED AT EXTREME ENDS.
11. DOOR INTERLOCK SHALL BE SUCH THAT THE DOOR CAN NOT BE OPENED WITH THE BREAKER AND FSU IN 'ON' POSITION.
12. TWO SET'S OF OPERATION AND MAINTANANCE MANUAL SHALL BE SUPPLIED BY PANEL MANUFACTURER ALONG WITH THE PANEL.
13. INCOMING POWER SUPPLY THROUGH CABLES. (BY BHEL /PEM)
14. OUT GOING POWER CABLE SIZES :—
a) FOR EC : 2X2C—120 SQ.MM AL. HR PVC INSULATED UNAR./EC.
b) FOR EOH : 1X3C—10 SQ.MM AL.HRPVC INSULATED UNAR. /EOH.
c) FOR AC/VENT : PEM/CUSTOMER TO INDICATE
d) FOR LIGHTING : PEM/CUSTOMER TO INDICATE
15. LED CLUSTER TYPE INDICATING LAMP SHALL BE PROVIDED FOR THE FOLLOWING:
a) MAINS ON (RED, YELLOW, BLUE.)
b) BREAKER ON, OFF, AUTO TRIP (RED, GREEN, AMBER).
c) BREAKER SPRING CHARGED (WHITE).
d) BREAKER IN TEST POSITION (WHITE).
e) BREAKER IN SERVICE POSITION (BLUE).
f) BREAKER TRIP CIRCUIT HEALTHY (WHITE).
16. EACH ACBs SHALL BE PROVIDED WITH A SINGLE.
NUMERICAL RELAY HAVING FOLLOWING FUNCTIONS :
a) OVER CURRENT RELAY (51)
b) EARTH FAULT RELAY (51N)
c) UNDER VOLTAGE RELAY (27)
d) FUSE FAILURE RELAY(98)
e) ANTIPUMPING RELAY (94)
f) TRIP CIRCUIT SUPERVISION RELAY (74) (SELF RESET)
g) TRIP ANNUNCIATION RELAY (30A,B) (SELF RESET)
h) LOCK—OUT RELAY HAND RESET(86) WITH BLUE LAMP
i) CHECK SYNCHRONIZING RELAY (25)—FOR ACHIEVING MOMENTARY PARALLELING BETWEEN TWO SOURCES.
j) INSTANTANEOUS OVER CURRENT RELAY(50).
k) INSTANTANEOUS OVER CURRENT RELAY — NEUTRAL(50N).
l) INSTANTANEOUS OVER CURRENT RELAY —BUS FIELD — (50 BF).
m) METERING FACILITY.
17. ALL BREAKERS SHALL BE THREE POLE ELECTRICALLY OPERATED DRAW—OUT TYPE.
18. NECESSARY RELAYS & TIMERS SHALL BE PROVIDED, FOR ALL BREAKERS.
19. TWO NUMBERS INTERPOSING RELAYS FOR EACH BREAKER (ONE FOR CLOSING, ONE FOR TRIPPING THE BREAKER) SHALL BE SUPPLIED AND WIRED BY THE ESPSG PANEL MANUFACTURER.
- 01 20. AUTO CHANGE OVER SCHEME SHALL BE PROVIDED AS FOLLOWS:
a) NORMALLY BUSCOUPLER WILL BE UNDER OPEN CONDITION.
b) AUTO CHANGEOVER SHLL BE EFFECTED WHEN THERE IS PROLONGED UNDERVOLTAGE ON ANY ONE OF THE BUS SECTIONS, THE RESPECTIVE INCOMING BREAKER SHALL TRIP AND THE BUS COUPLER SHALL CLOSE, PROVIDED VOLTAGE IS AVAILABLE ON THE OTHER BUS SECTION.
c) TOTAL CHANGEOVER TIME SHALL NOT EXCEED 1.5 SECONDS.
d) THIS AUTO CHANGEOVER SHALL BE BLOCKED IF THE INCOMING BREAKER HAD TRIPPED EITHER ON A BUS FAULT OR MANUALLY.

- e) CHANGEOVER BACK TO NORMAL SOURCE SHALL BE EFFECTED MANUALLY.
- f) MANUAL LIVE CHANGEOVER FACILITY SHALL BE PROVIDED.
- g) ALL COMPONENTS REQUIRED FOR MEETING THE ABOVE FUNCTIONAL REQUIREMENTS STATED ABOVE SHALL BE PROVIDED BY THE LTMSB MANUFACTURER.
- h) CHECK SYNCHRONISATION RELAY SHALL BE PROVIDED FOR AUTO CHANGE OVER OF BREAKERS.
- i) WHEN PLANNED OUTAGE OF ONE OF THE NORMAL INCOMING SUPPLY IS REQUIRED, THE RESPECTIVE INCOMER SHALL BE TRIPPED AUTOMATICALLY AFTER THE BUS COUPLER IS CLOSED MANUALLY (FOR THIS PURPOSE A SELECTION SHALL BE PROVIDED IN THE LT MAIN SWITCH BOARD FOR SELECTING THE INCOMER TO BE TRIPPED) THUS DEPENDING UPON THE SELECTION MADE, INCOMER TO BUS SECTION—A OR TO BUS SECTION—B WILL BE TRIPPED ONCE THE BUS COUPLER IS CLOSED MANUALLY, THUS MAINTAINING CONTINUITY OF SUPPLY. (NECESSARY AUTO/MANUAL SELECTOR SWITCH AND TIMERS SHALL BE PROVIDED IN THE ESP—MCC PANEL BOARD).
- j) TIMER WITH A TIMER DELAY ON PICK UP OF 0.5 – 5 SEC FOR ANNUNCIATION OF RUNNING BREAKER FAILING TO TRIP, WITH A PRESET TIME (IF THE TWO SOURCES REMAIN PARALLELED FOR MORE THAN A PRESENT TIME) SHALL BE PROVIDED. ALSO THIS TIMER SHALL EFFECT TRIP OF THE BREAKER THAT WAS BROUGHT IN IF THE FIRST BREAKER FAILS TO TRIP)
- k) WHEN THE NORMAL SUPPLY IS TO BE BROUGHT BACK INTO OPERATION. THE INCOMER BREAKER SHALL BE CLOSED WHEREUPON THE BUS COUPLER SHALL TRIP AUTOMATICALLY.
21. THE FOLLOWING SWITCHES SHALL BE PROVIDED IN EACH BREAKER CIRCUIT.
i) BREAKER CONTROL SWITCH (1NO)
ii) SWITCH GEAR/NORMAL SELECTOR SWITCH(LOCAL/REMOTE)(1NO).
iii) DC ISOLATING SWITCH (1NO).
22. DEGREE OF PROTECTION:
i) FOR COMPARTMENTS AND BUSBAR CHAMBERS UP TO 1600A : IP 54 AS PER IS 13947.
23. THE ESPSG SHALL BE EXTENDABLE AT BOTH ENDS WITH OUTGOING FEEDERS.
24. NECESSARY AUXILIARY RELAYS AND AUXILIARY CONTACTORS SHALL BE PROVIDED IN THE INCOMER MODULES.
25. INCOMERS BUSDUCT ENTRY SHALL BE FROM SIDE & TOP AND OUTGOING CABLE ENTRY SHALL BE FROM BOTTOM.
26. PANEL COLOUR : RAL 9002 FOR FRONT & REAR AND RAL5012 FOR EXTREME END COVERS.
27. PAINT THICKNESS SHALL NOT BE LESS THAN 50 MICRON.
28. OPERATING HEIGHT (HANDLE/PUSH BUTTON POSITION) SHALL BE RESTERICTED BETWEEN 200mm AND 1800mm.FROM FLOOR LEVEL.
29. ALL RELAYS SHALL BE OF FLUSH MOUNTED, DRAW—OUT, SELF RESET TYPE AND SHALL BE PROVIDED WITH FLAG INDICATION (HOWEVER LOCK—OUT RELAY SHALL BE OF HAND RESET TYPE).
30. PANEL CONTROL WIRING SHALL BE 2.5SQ.MM PVC 1100V GRADE COPPER FLEXIBLE CABLE.
31. CHECK SYNCHRONISATION FACILITY TO BE PROVIDED IN NUMERICAL RELAYS.
32. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL RELAY WITH IEC 61850 COMMUNICATION PROTOCOL AND SHALL BE WITH DUAL REDENDANCY OUTPUT AND ONE PORT FOR LAPTOP CONNECTION.
33. ALL NUMERICAL RELAYS SHALL BE CONNECTED WITH EITHERNET SWITCH LOCATED IN ONE OF THE INCOMER MODULE.
34. MULTIFUNCTION METER SHALL BE MODBUS RS485 WITH COMMUNICATION PROTOCOL.
35. PANEL THICKNESS LOAD BEARING — 2MM (MIN)
NO LOAD BEARING — 1.6MM (MIN)
GLAND PLATE — 3MM
- 01 36. ALL CT'S SHALL BE PS CLASS.

LEGEND: —

A	—	AMMETER
V	—	VOLTMETER
ASS	—	AMMETER SELECTOR SWITCH (OFF/R/Y/B)
VSS	—	VOLTMETER SELECTOR SWITCH (OFF/R/Y/B/BR)
CT	—	CURRENT TRANSFORMER
RM	—	RAPPING MOTOR
EC	—	ELECTRONIC CONTROLLER
>>	—	DRAWOUT TERMINAL
TP	—	TRIPLE POLE
51	—	IDMT
	—	OVERCURRENT PROTECTION RELAY,
	—	SETTING RANGE FOR CURRENT : 50% TO 200%
	—	SETTING RANGE FOR TIME : 0.1 TO 1.3 SEC.
51N	—	INVERSE TIME EARTH FAULT RELAY
86	—	DMT 1.3 SEC, E/F SETTING 10–40%
27	—	HAND RESET LOCK—OUT RELAY WITH BLUE LAMP
2	—	UNDER VOLTAGE RELAY
95	—	TIMER RELAY
DPDT	—	TRIP CIRCUIT SUPERVISION RELAY.
TPN	—	DOUBLE POLE DOUBLE THROW
ALI	—	TRIPLE POLE & NEUTRAL
FSU	—	ASH LEVEL INDICATOR
KWH	—	FUSE SWITCH UNIT
PF	—	COMMUNICABLE TYPE MULTI FUNCTION KILOWATT HOUR
CF	—	METER WITH TEST TERMINAL BLOCK
LK	—	POWER FUSE
L	—	CONTROL FUSE
SP	—	LINK
ESPSG	—	INDICATING LAMP(LED TYPE)
EOH	—	SPARE
JB	—	ESP SWITCHGEAR PANEL
SS	—	ELECTRICALLY OPERATED HOIST
CST	—	JUNCTION BOX
HH	—	SELECTOR SWITCH
HI	—	CONTROL SUPPLY TRANSFORMER
HS	—	HOPPER HEATER
C	—	SUPPORT INSULATOR HEATER
TH	—	SHAFT INSULATOR HEATER
SSPB	—	CONTACTOR
O/L	—	THERMOSTAT
PB	—	START STOP PUSH BUTTON STATION
DDM	—	THERMAL OVERLOAD RELAY
	—	PUSH BUTTON
	—	DUST DENSITY MONITOR

FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377

मेकॉन लिमिटेड
MECON LIMITED



NTPC—SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

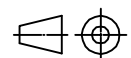
DEPT CODE	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: NOTES AND LEGENDS FOR ESP SWITCH GEAR PANEL

BHEL/BAP DRG.NO.

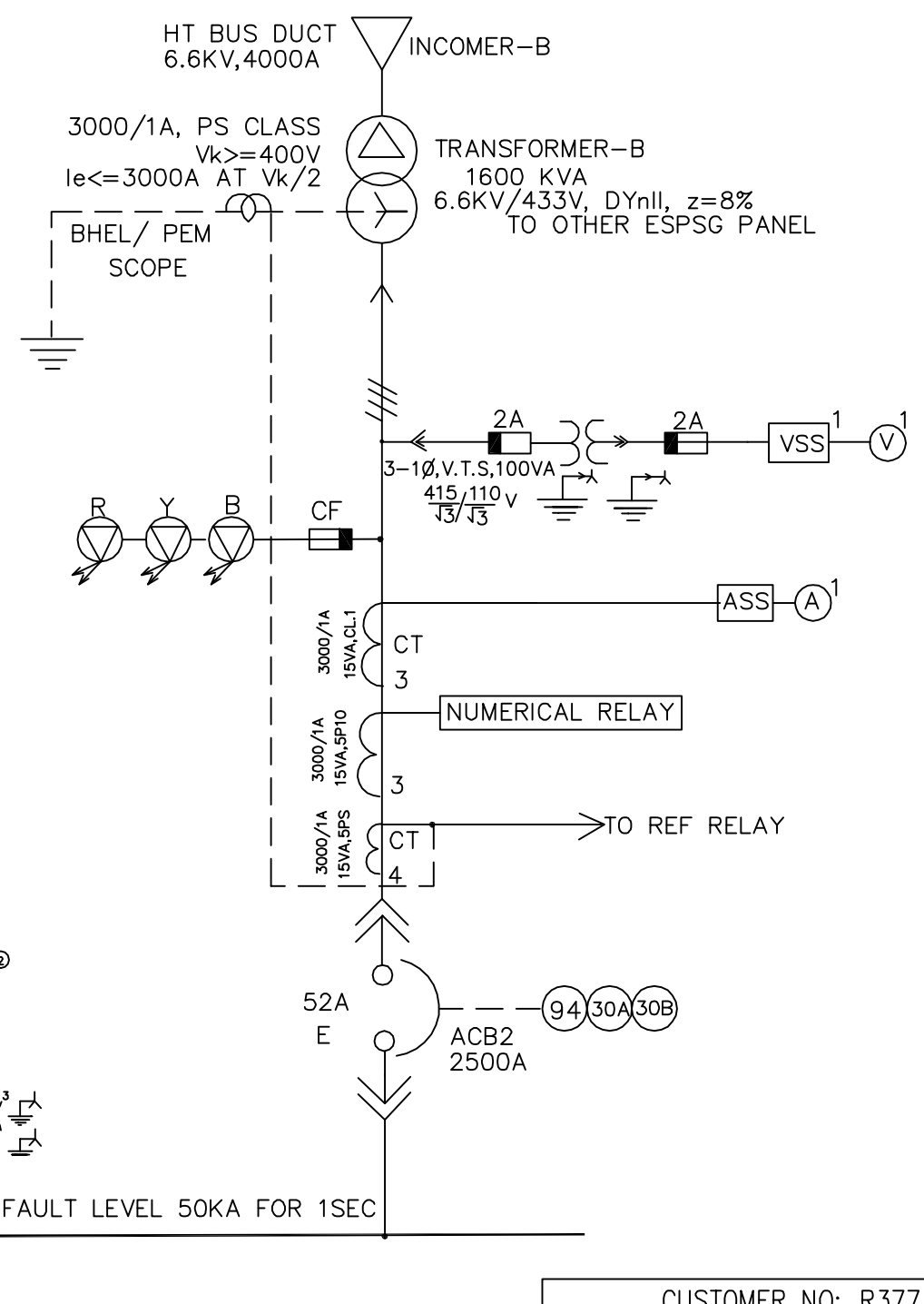
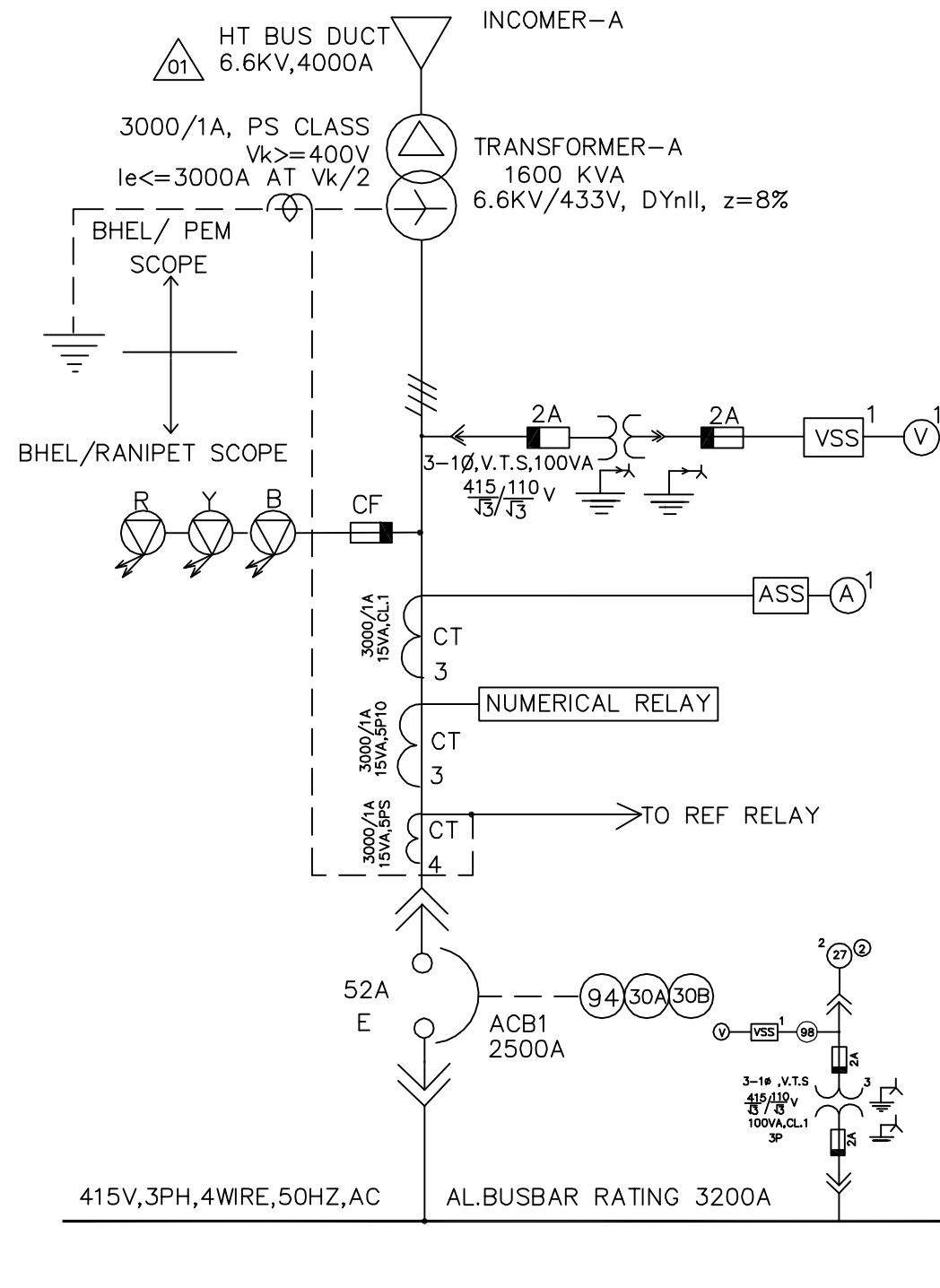
3–00–114–39783

SCALE : N.T.S



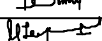
SHEET 01 OF 01

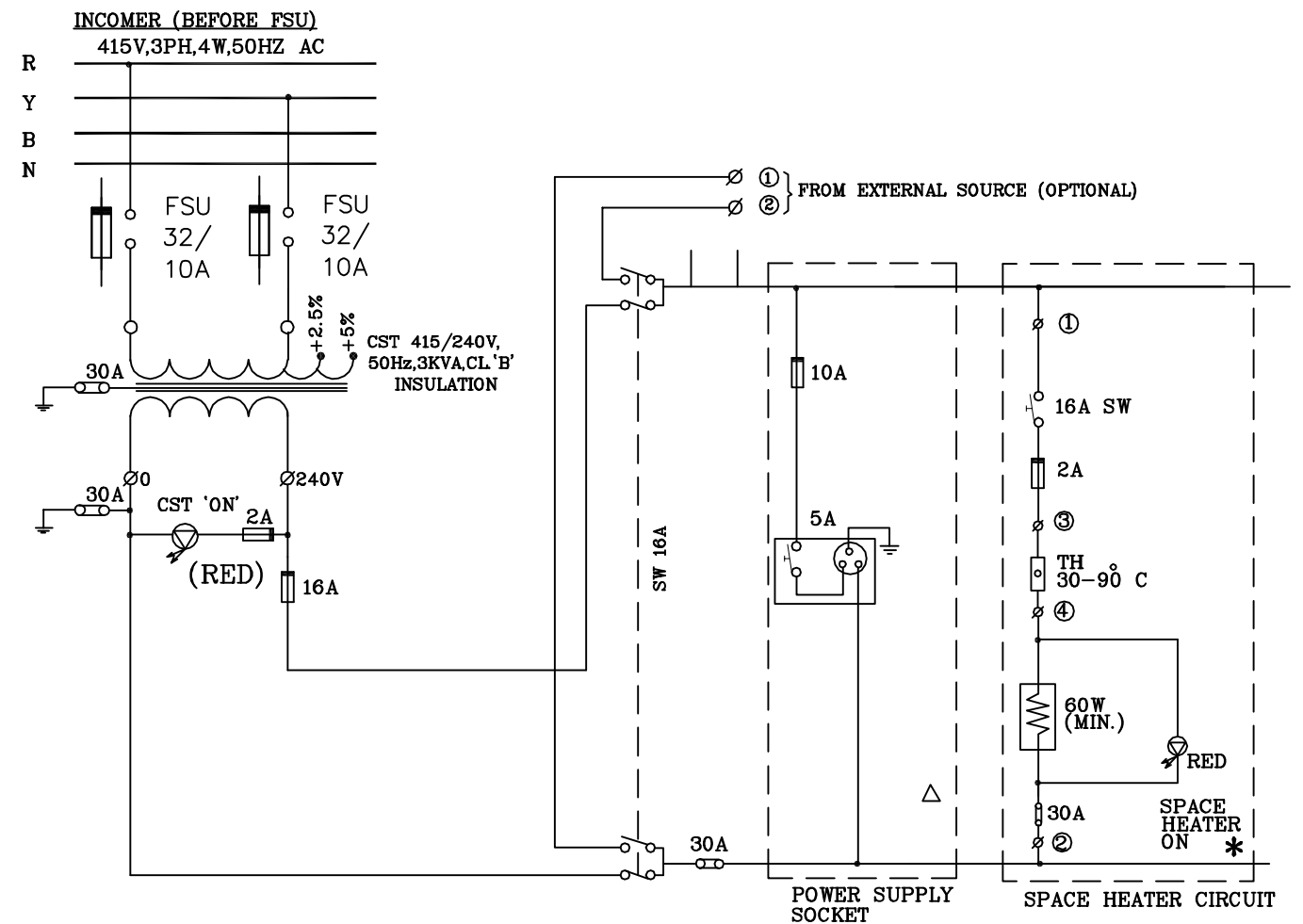
REV 02



FOR TENDER PURPOSE ONLY

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

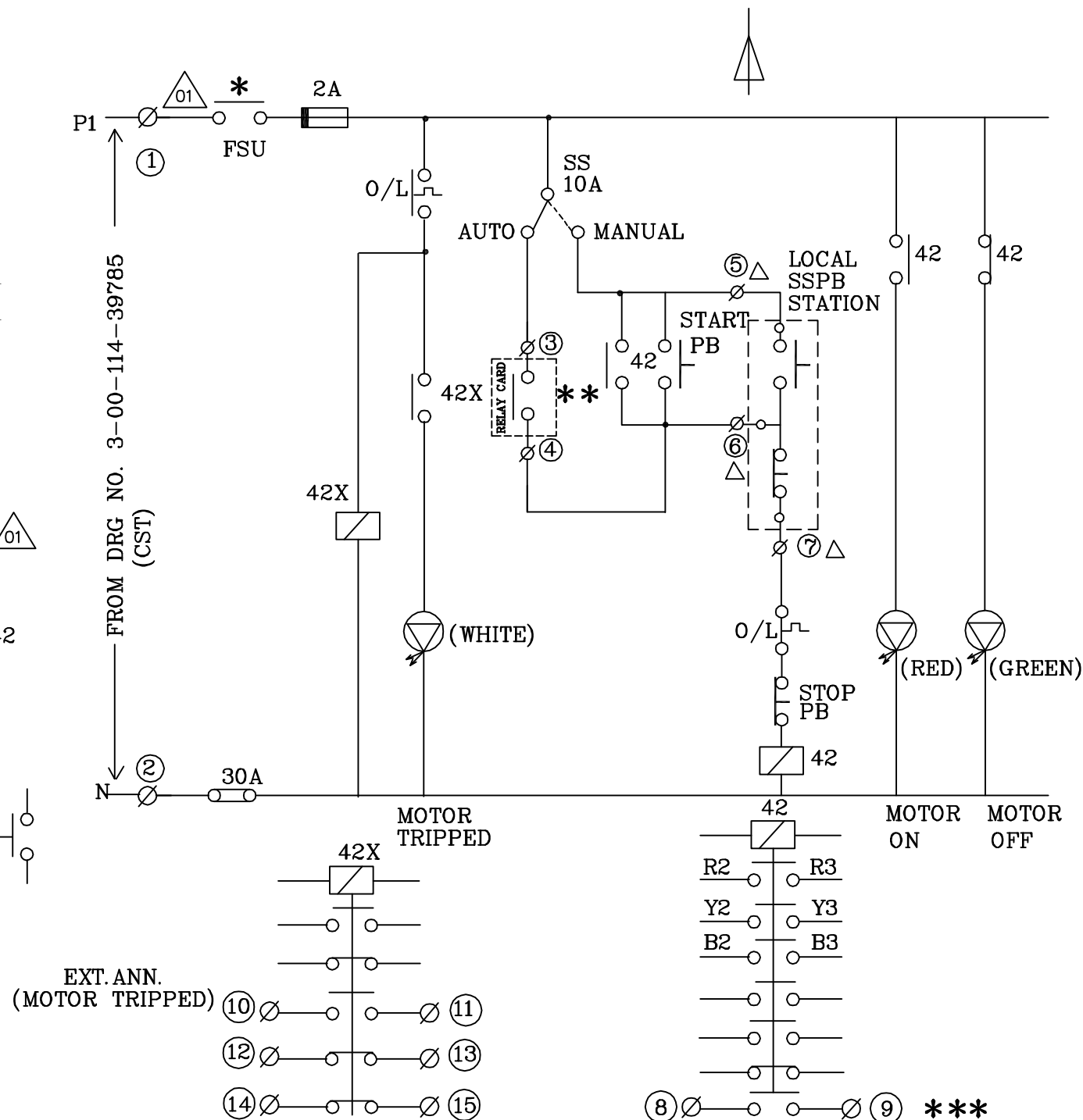
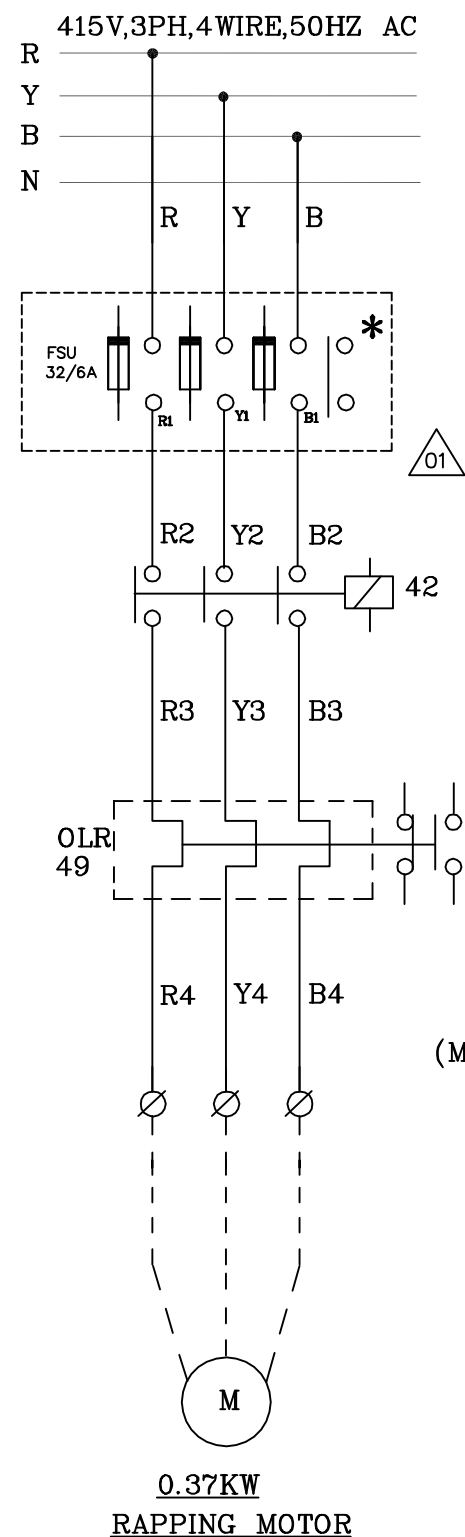
					CUSTOMER NO: R377				
मेकॉन लिमिटेड MECON LIMITED									
					NTPC-SAIL POWER COMPANY PVT. LTD. NSPCL ROURKELA 1x250MW STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE				
 BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.					DEPT CODE M		NAME	SIGN	DATE
						DRN	S.PRAKASH.		13.10.2016
						DESN	D.SREERAMULU		13.10.2016
						CHD	D.SREERAMULU		13.10.2016
						APPD	M.J.M		13.10.2016
TITLE: INCOMER CIRCUIT ESPSG									
BHEL/BAP DRG.NO. 3-00-114-39784					SCALE : N.T.S				
									
					SHEET 01 OF 01				
					REV 02				



01. * THE SPACE HEATER CIRCUIT SHOWN IS FOR ONE CABLE ALLEY. NUMBER OF SUCH CIRCUIT DEPENDS UPON THE NUMBER OF CABLE ALLEY.
02. Δ ONE NO. INDUSTRIAL TYPE POWER SUPPLY SOCKET PER PANEL SHALL BE LOCATED IN ALL CABLE ALLEY.

REV 02	DATE 28.07.17	ALTD A K P	CHD A K P	APPD M J M
	REVISED BASED ON CUSTOMER FEEDBACK			
REV 01	DATE 31.05.17	ALTD A K P	CHD A K P	APPD M J M
	REVISED BASED ON CUSTOMER FEEDBACK			

		मेकॉन लिमिटेड MECON LIMITED				
		NTPC-SAIL POWER COMPANY PVT. LTD. NSPCL ROURKELA 1x250MW STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE				
 BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.	DEPT CODE M		NAME	SIGN	DATE	
		DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016	
		DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016	
		CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016	
		APPD	M.J.M	<i>M. J. M</i>	13.10.2016	
TITLE: CONTROL SUPPLY TRANSFORMER SPACE HEATER CIRCUIT						
BHEL/BAP DRG.NO. 3-00-114-39785		SCALE : N.T.S 		— SHEET 01 OF 01		REV 02



△ OUTGOING TERMINALS FOR SSPB CONTROL, TO BE LOCATED AT SEPARATE MARSHALLING COMPARTMENT

** FROM ARECA RELAY CARD
*** TO ARECA BUFFER CARD

FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377



मेकॉन लिमिटेड
MECON LIMITED



NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

DEPT
CODE
M

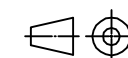
	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: POWER AND CONTROL CIRCUIT FOR RAPPING MOTORS

BHEL/BAP DRG.NO.

3-00-114-39786

SCALE : N.T.S



SHEET 01 OF 01

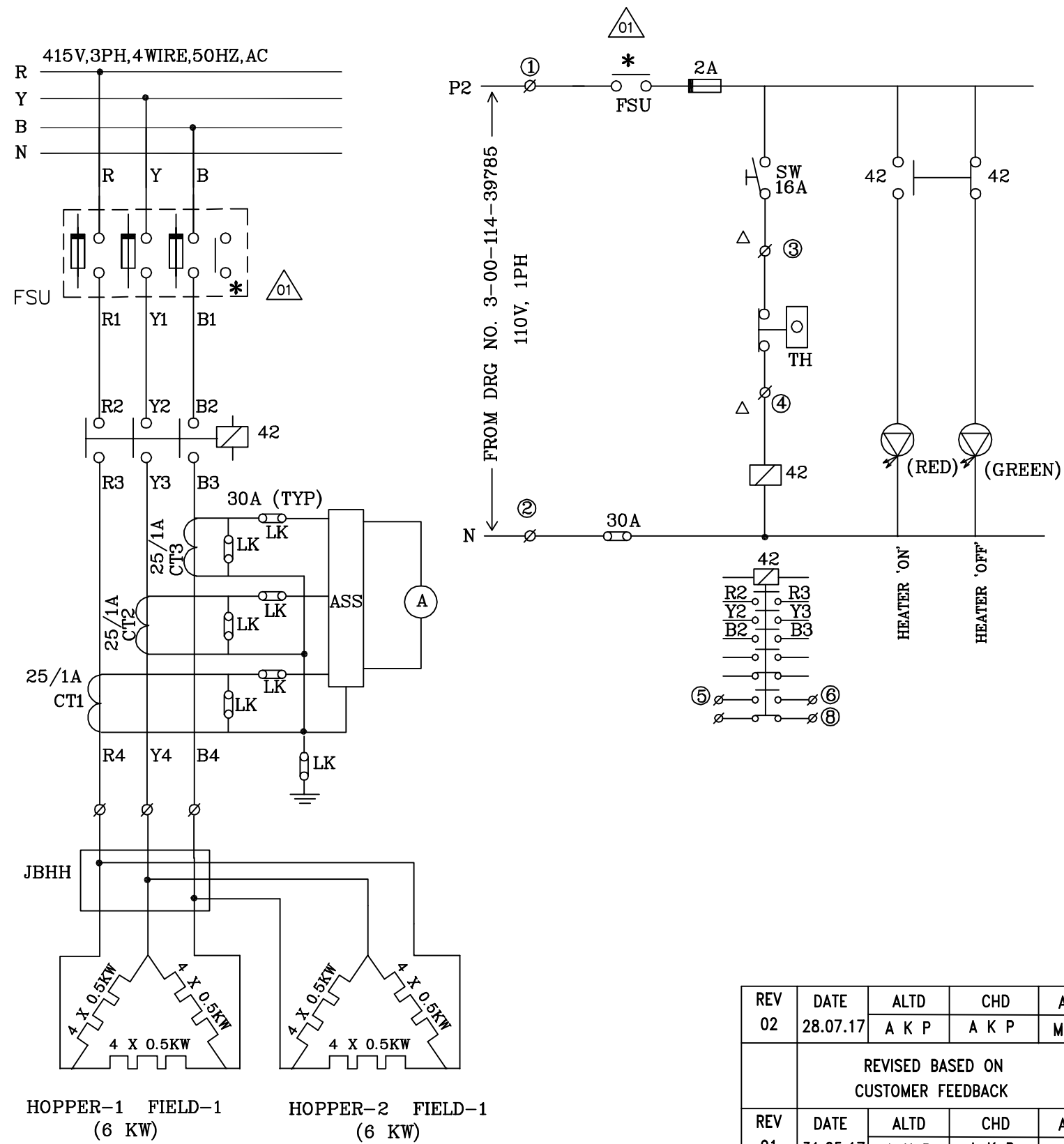
REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M

REVISED BASED ON
CUSTOMER FEEDBACK

REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M

REVISED BASED ON
CUSTOMER FEEDBACK



FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377



मेकॉन लिमिटेड
MECON LIMITED



NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

DEPT
CODE
M

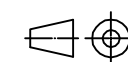
	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: POWER AND CONTROL CIRCUIT
FOR HOPPER HEATER

BHEL/BAP DRG.NO.

3-00-114-39787

SCALE : N.T.S



SHEET 01 OF 01

REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M

REVISED BASED ON
CUSTOMER FEEDBACK

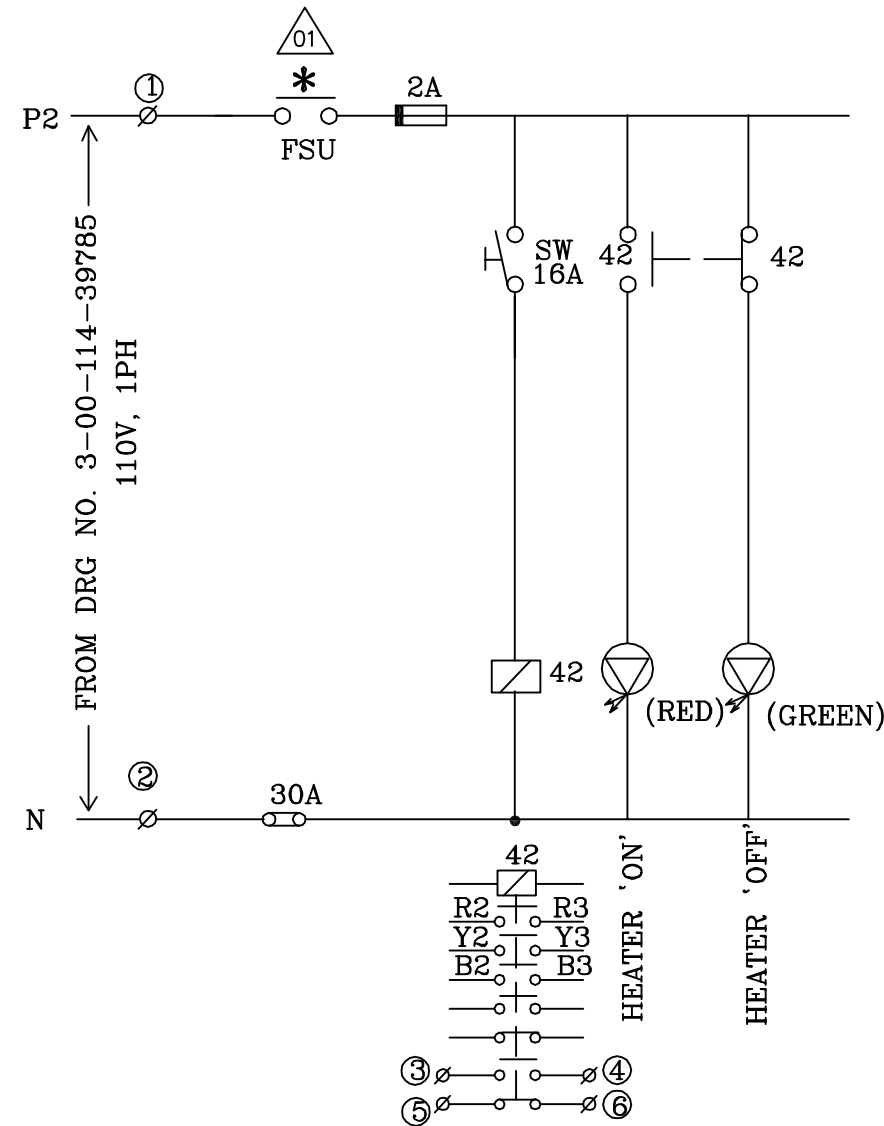
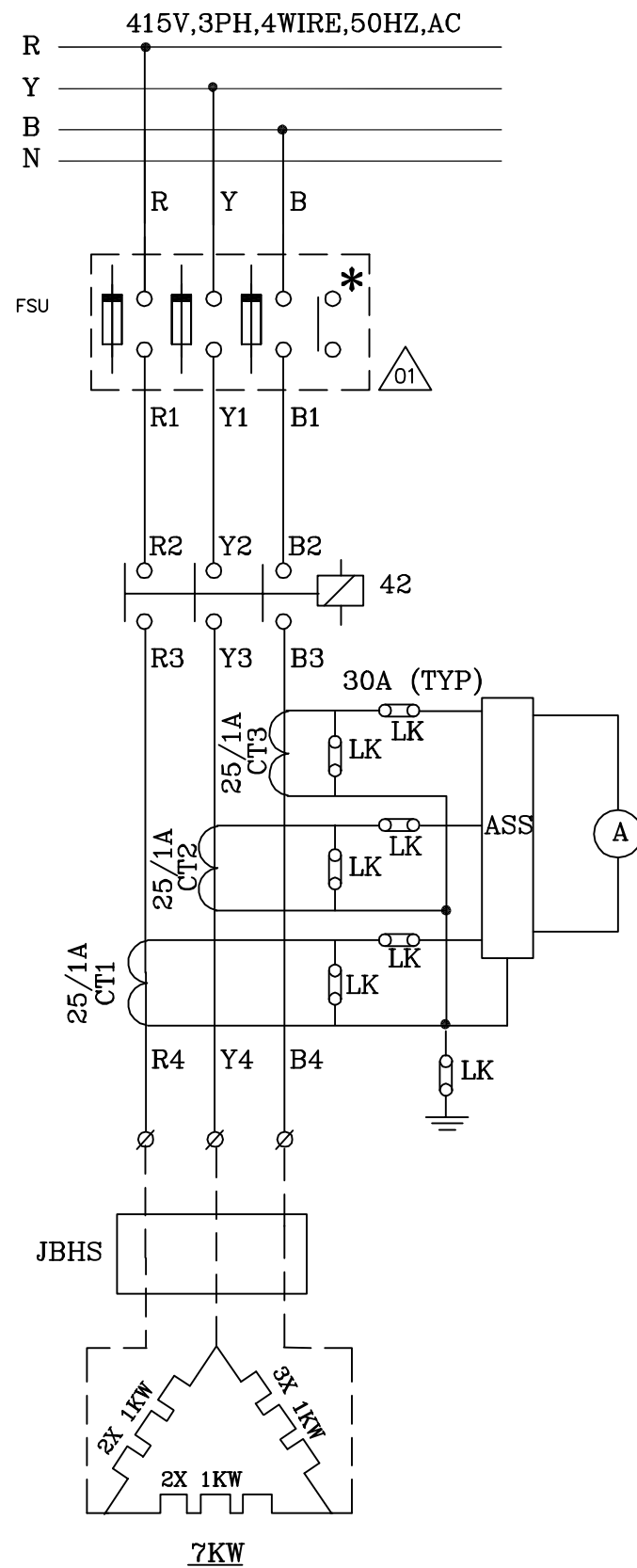
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M

REVISED BASED ON
CUSTOMER FEEDBACK

3-00-114-39788

DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES



FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377



मेकॉन लिमिटेड
MECON LIMITED



NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

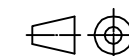
DEPT
CODE
M

	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE:
POWER AND CONTROL CIRCUIT FOR SHAFT INSULATOR HEATER.

BHEL/BAP DRG.NO.
3-00-114-39788

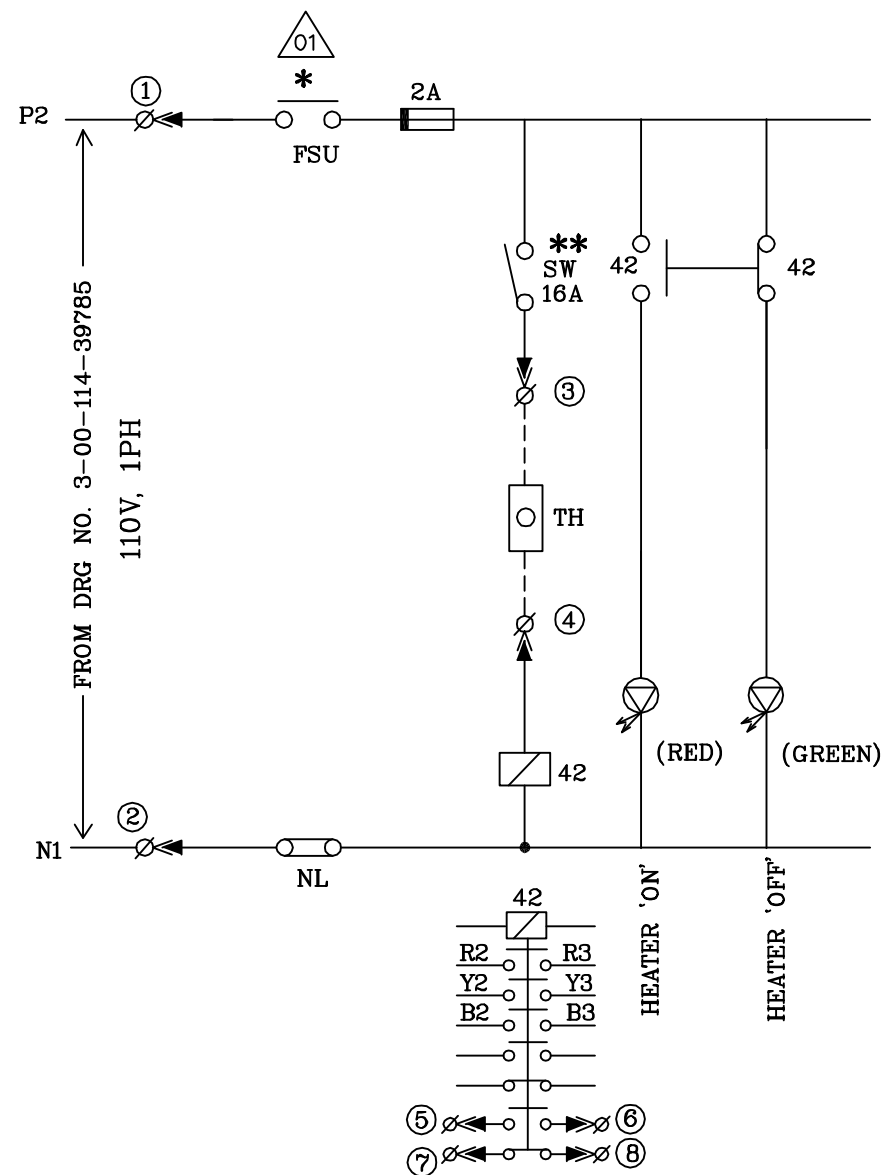
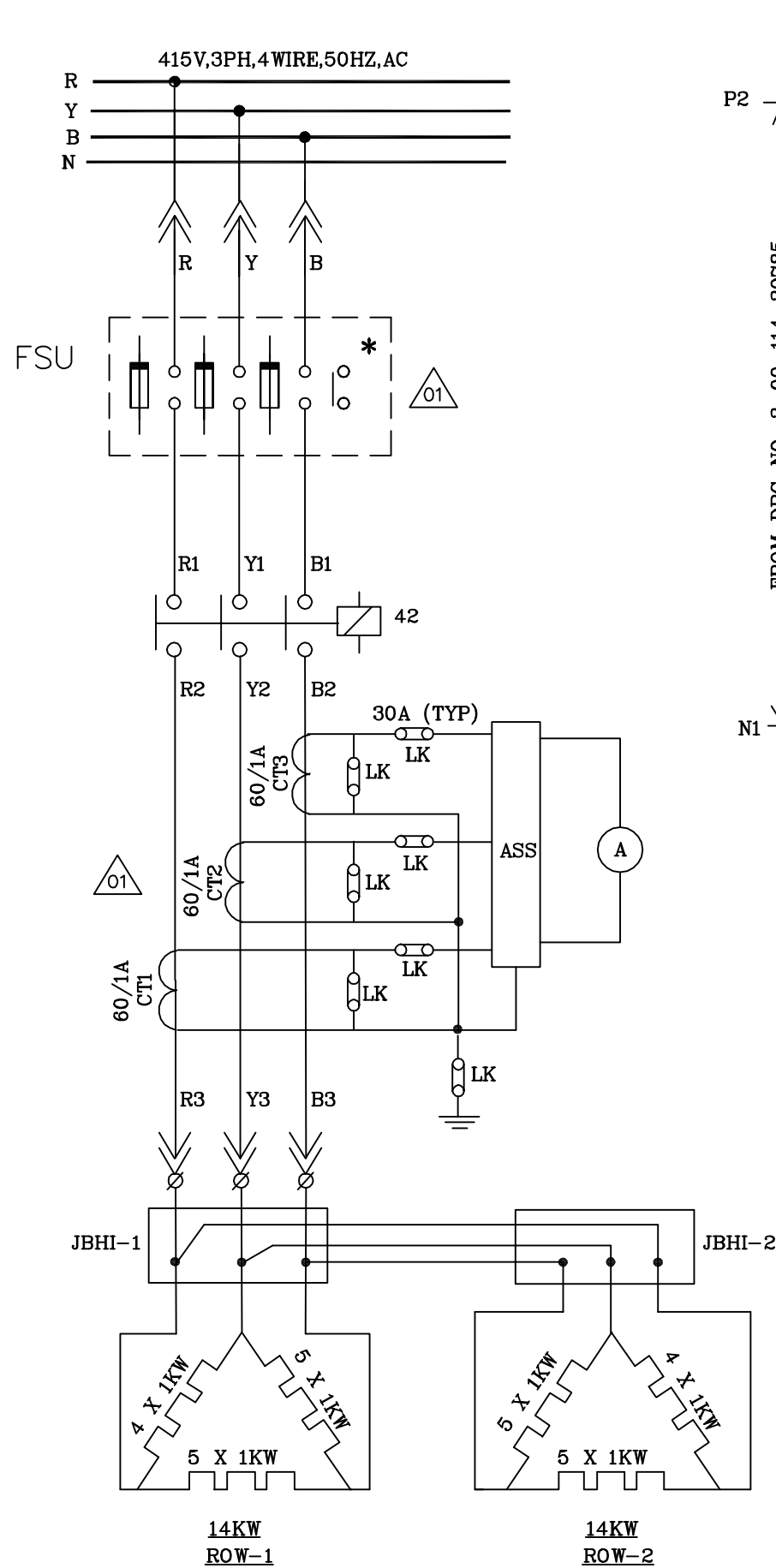
SCALE : N.T.S



SHEET 01 OF 01

REV 02

Size A3



ITEM	CABLE SIZE	QTY/ACP
SUPPORT INSULATOR HEATER THERMOSTAT	1X3C-1.5CU	1

NOTE

****** - TOGGLE TYPE SWITCH IS NOT ACCEPTABLE. SWITCH SHALL BE ROTARY ON-OFF TYPE.

LEGEND

<< >> CLOSE IN SERVICE POSITION ONLY
 < > CLOSE IN BOTH SERVICE AND TEXT POSITION

FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377



मेकॉन लिमिटेड
MECON LIMITED



NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

DEPT
CODE
M

	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: POWER AND CONTROL CIRCUIT
FOR SUPPORT INSULATOR HEATER.

BHEL/BAP DRG.NO.

3-00-114-39789

SCALE : N.T.S



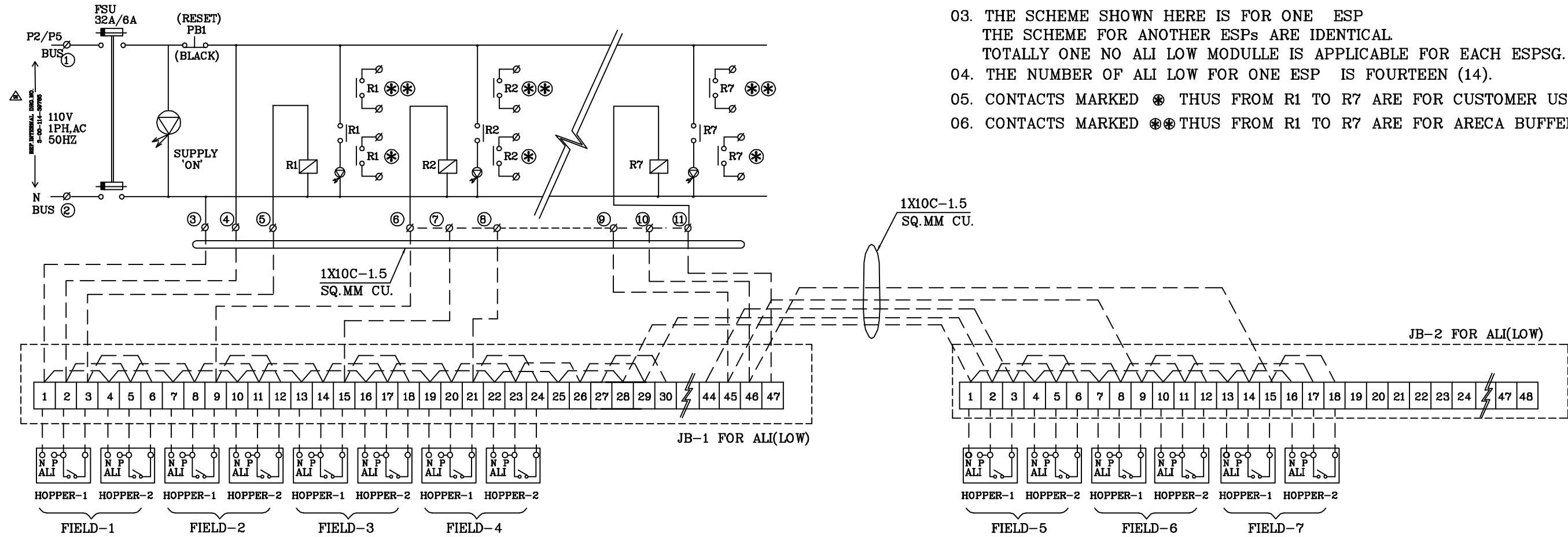
SHEET 01 OF 01

REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

NOTE :

01. THE JUNCTION BOXES AND ALI ARE SUPPLIED DIRECTLY TO SITE BY BHEL AND THE SAME ARE NOT IN THE PANEL MANUFACTURER'S SCOPE.
02. TOTALLY 7 AUXILIARY CONTACTORS AND 8 LAMPS ARE APPLICABLE FOR EACH MODULE.
03. THE SCHEME SHOWN HERE IS FOR ONE ESP THE SCHEME FOR ANOTHER ESPs ARE IDENTICAL. TOTALLY ONE NO ALI LOW MODULE IS APPLICABLE FOR EACH ESPSG.
04. THE NUMBER OF ALI LOW FOR ONE ESP IS FOURTEEN (14).
05. CONTACTS MARKED * THUS FROM R1 TO R7 ARE FOR CUSTOMER USE.
06. CONTACTS MARKED ** THUS FROM R1 TO R7 ARE FOR ARECA BUFFER CARD.



CONTROL CABLE GROUPING CHART :

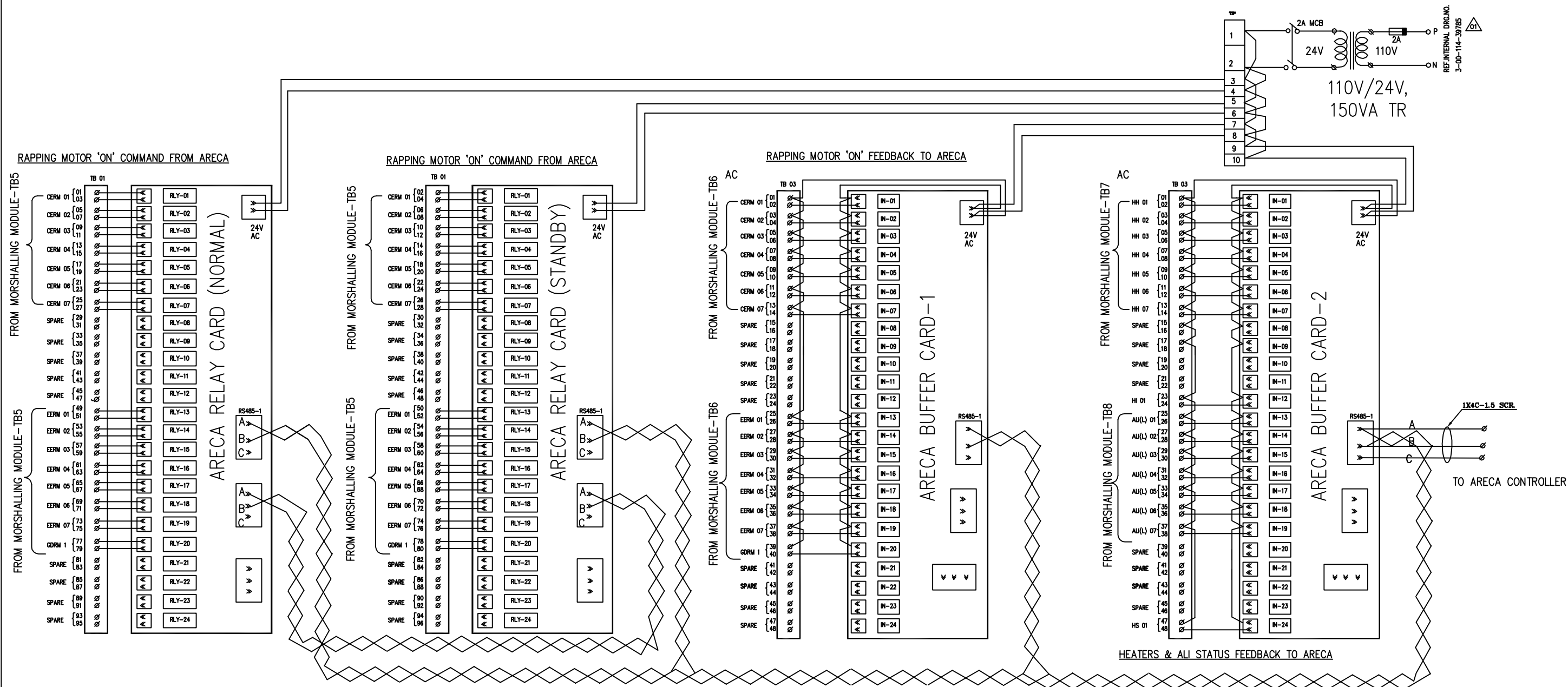
ITEM	CABLE SIZE	QTY/ ESPSG
TO JB FOR ALI	1X10C-1.5SQMM	1
JB-1 TO JB-2	1X10C-1.5SQMM	1

FOR TENDER PURPOSE ONLY

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

CUSTOMER NO: R377		
MECON LIMITED		
NTPC-SAIL POWER COMPANY PVT. LTD. NSPCL ROURKELA 1x250MW STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE		
BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.		
DEPT CODE M	NAME SIGN DATE	
DRN	S.PRAKASH.	13.10.2016
DESIN	D.SREERAMULU	13.10.2016
CHD	D.SREERAMULU	13.10.2016
APPD	M.J.M	13.10.2016
TITLE: ASH LEVEL INDICATOR CIRCUIT (LOW)		
BHEL/BAP DRG.NO. 3-00-114-39791	SCALE : N.T.S.	
SHEET 01 OF 01		
REV 02		

ALL DIMENSIONS ARE IN MILLIMETRES



FOR TENDER PURPOSE ONLY

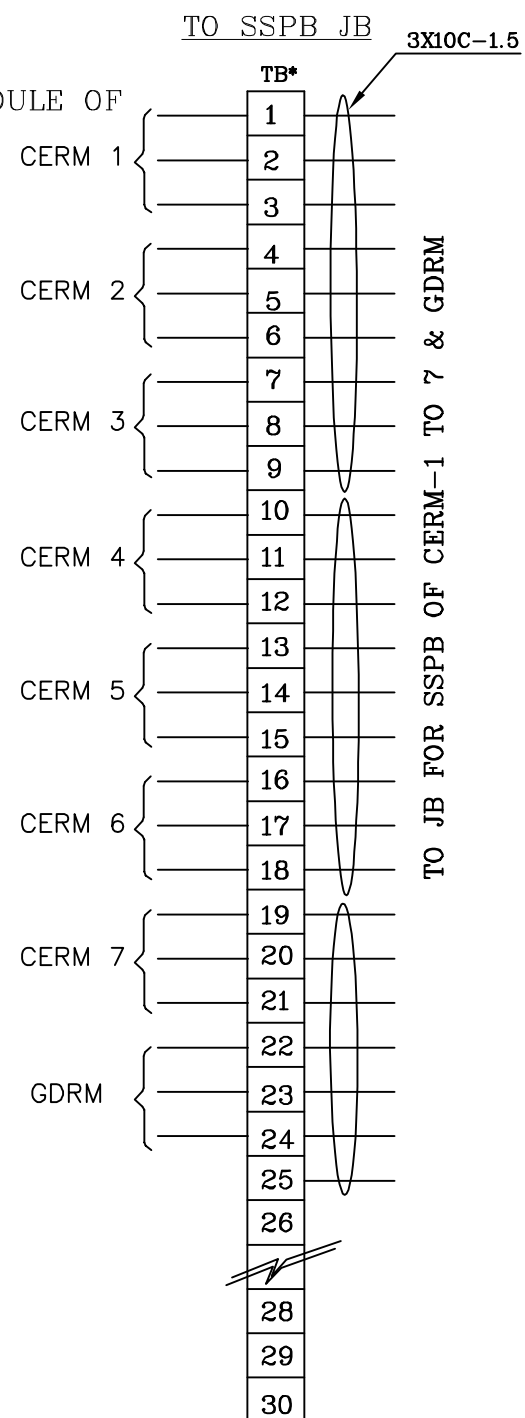
NOTE:

01. RELAY CARD -340(L)X120(W)X60(H) DIN RAILMOUNTED.
02. BUFFER CARD -310(L)X90(W)X60(H) DIN RAILMOUNTED.
03. THESE TERMINAL BLOCKS AND TERMINAL LOOPINGS SHOWN ARE TO BE PROVIDED BY THE PANEL(ESPSG) MANUFACTURER IN A SEPERATE MODULE.

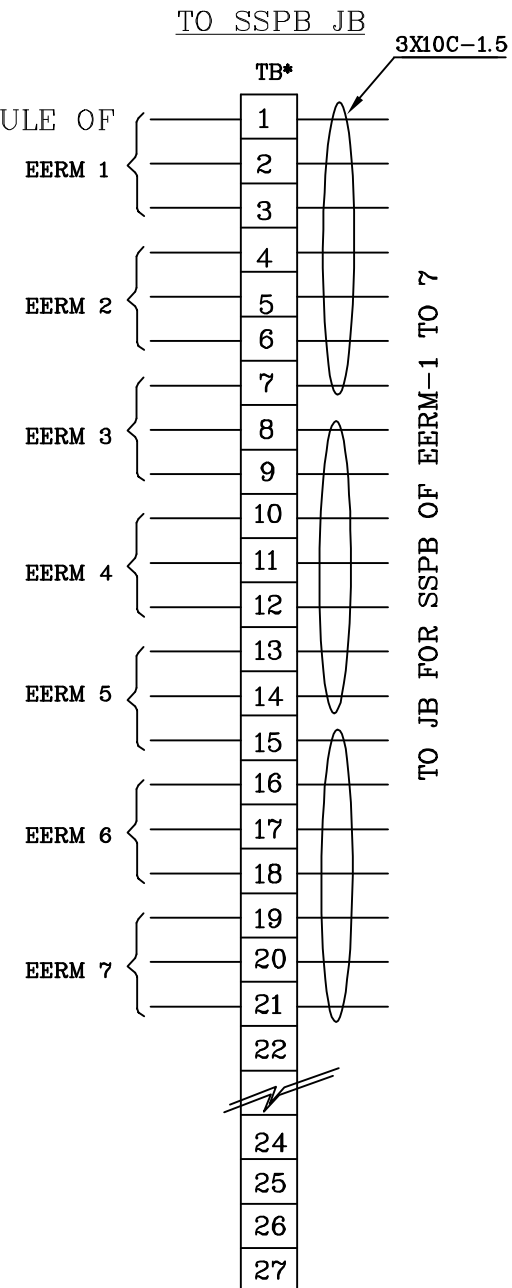
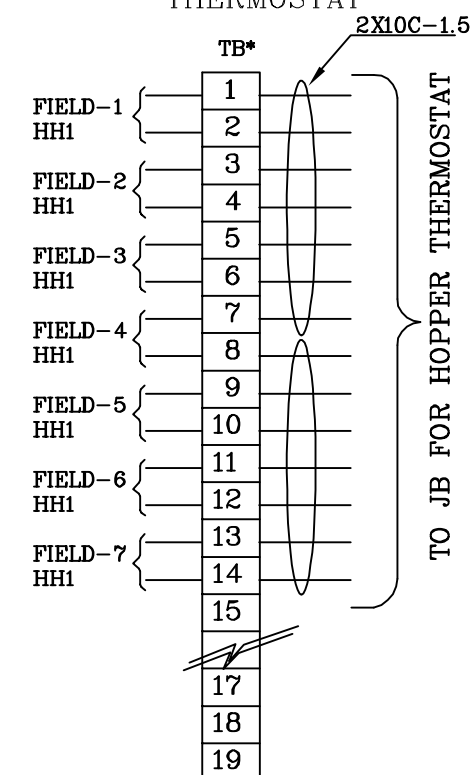
REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

CUSTOMER NO: R377				
 मेकॉन लिमिटेड MECON LIMITED				
 NTPC-SAIL POWER COMPANY PVT. LTD. NSPCL ROURKELA 1x250MW STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE				
 BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RAMIPET:632 406.	DEPT	NAME	SIGN	DATE
	DRN	S.PRAKASH.		13.10.2016
	DESN	D.SREERAMULU		13.10.2016
	CHD	D.SREERAMULU		13.10.2016
TITLE: ARECA ON/FEEDBACK SCHEME DRG IN ESPSG PANEL				
BHEL/BAP DRG.NO. 3-00-114-39792		SCALE : N.T.S	-	
			SHEET 01 OF 01	REV 02

01. ESPSG MODULE OF



ESPSG MODULE OF

HOPPER HEATER
THERMOSTAT

NOTE :

01. ' * ' - THESE TERMINAL BLOCKS AND TERMINAL LOOPINGS SHOWN ARE TO BE PROVIDED BY THE PANEL ESPSG MANUFACTURER IN A SEPERATE MODULE.

FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377

मेकॉन लिमिटेड
MECON LIMITEDNTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGEBHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET: 632 406.DEPT
CODE
M

	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: MARSHALLING MODULE FOR SSPB OF GDRM & CERM
EERM AND HOPPER HEATER THERMOSTAT

BHEL/BAP DRG.NO.

3-00-114-39793

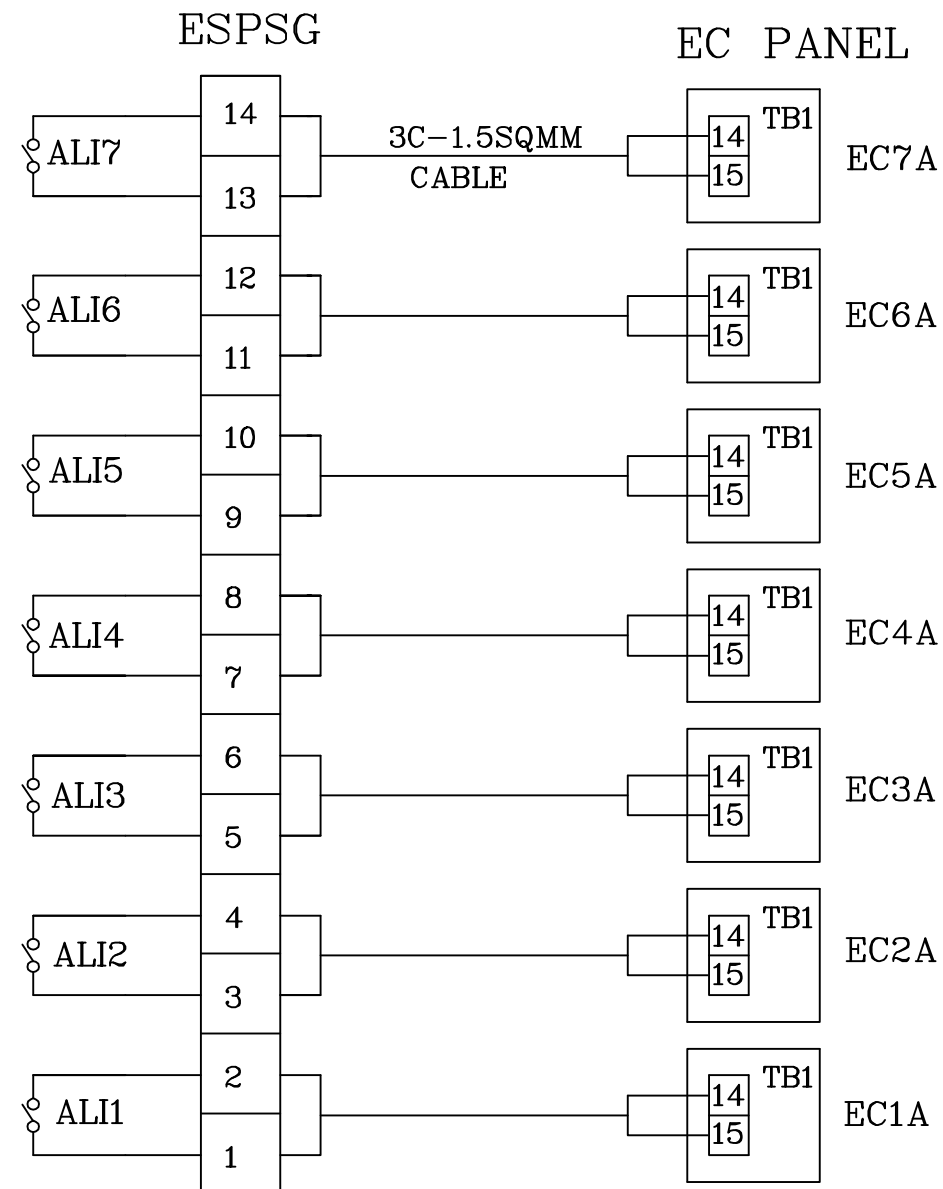
SCALE : N.T.S.



SHEET 01 OF 01

REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				



NOTE :

01. ' * ' – THESE TERMINAL BLOCKS AND TERMINAL LOOPINGS SHOWN ARE TO BE PROVIDED BY THE PANEL(ESPSG) MANUFACTURER IN A SEPERATE MODULE.

NOTE:

1. THE ABOVE SKETCH INDICATES INTERCONNECTION FOR 1 ESP. SIMILAR INTERCONNECTIONS APPLICABLE FOR OTHER ESP's..

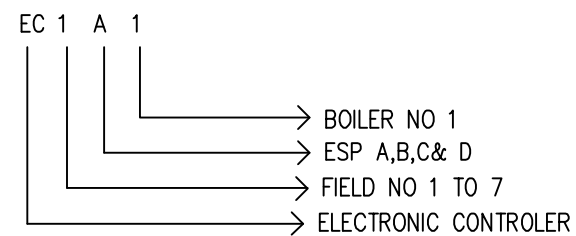
LEGEND

ESPSG ; ESP SWITCHGEAR PANEL

EC : ELECTRONIC CONTROL PANEL

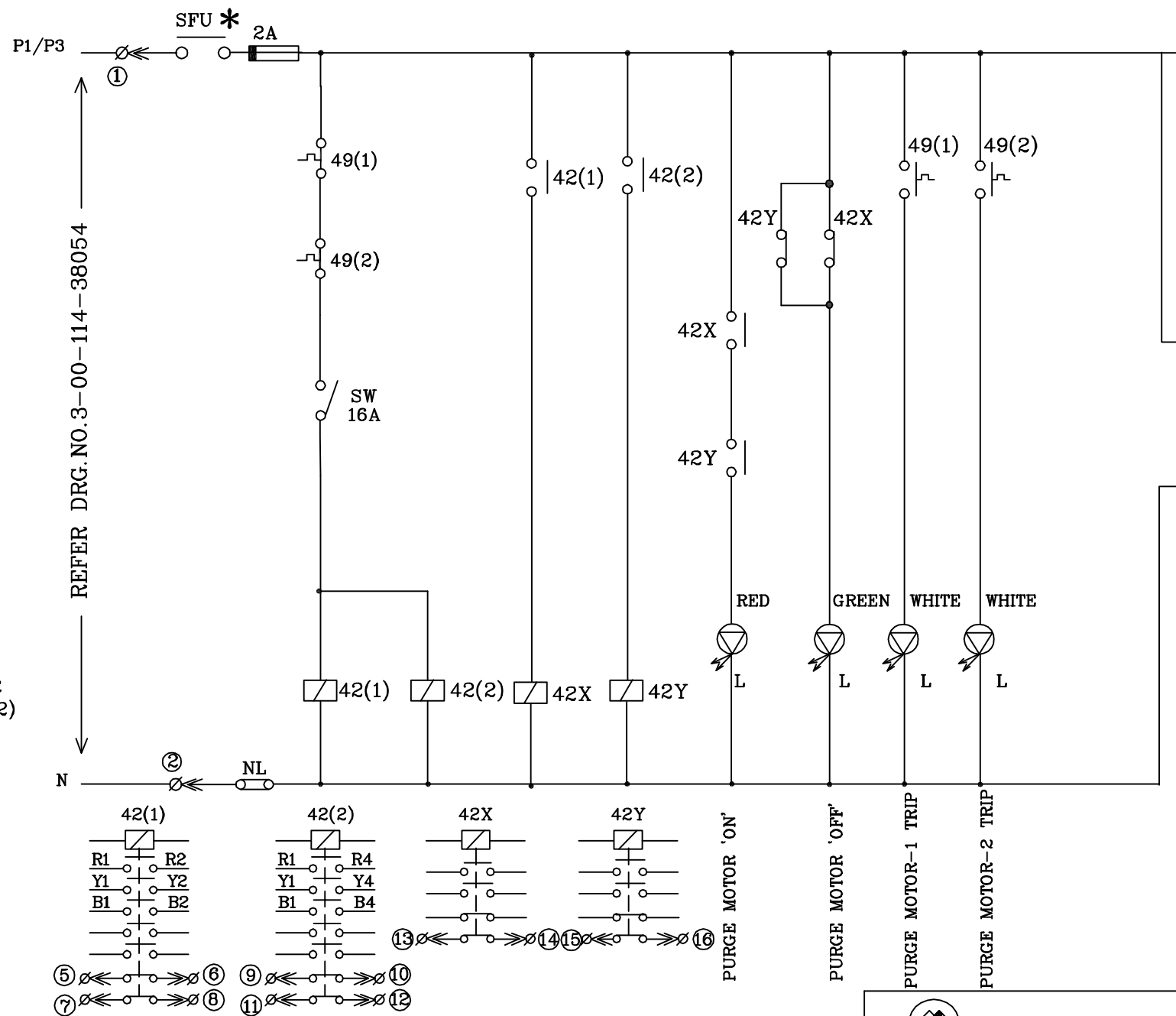
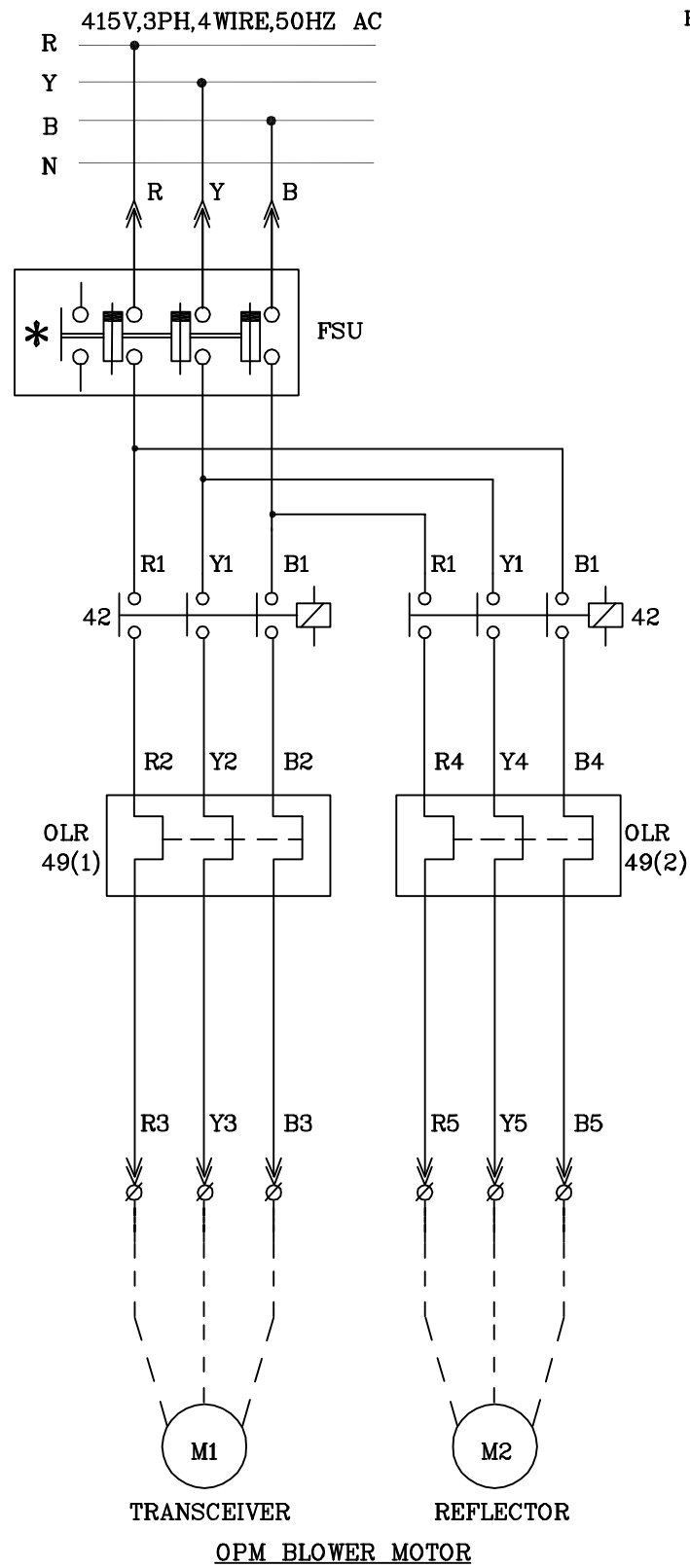
FOR TENDER PURPOSE ONLY

EC LEGEND



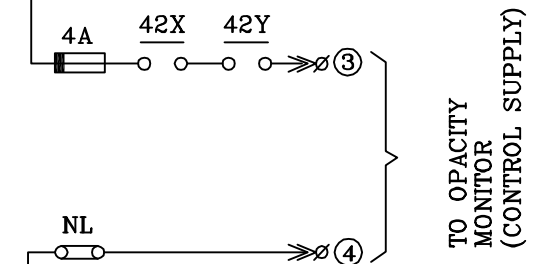
REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
REV	DATE	ALTD	CHD	APPD
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

CUSTOMER NO: R377							
 मेकॉन लिमिटेड MECON LIMITED							
 NTPC-SAIL POWER COMPANY PVT. LTD. NSPCL ROURKELA 1x250MW STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE							
D M		BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.	DEPT CODE M		NAME	SIGN	DATE
				DRN	S.PRAKASH.		13.10.2016
				DESN	D.SREERAMULU		13.10.2016
				CHD	D.SREERAMULU		13.10.2016
				APPD	M.J.M		13.10.2016
D M	TITLE: INTERCONNECTION BETWEEN ACP & EC(FOR ASH LEVEL HIGH SIGNAL)						
BHEL/BAP DRG.NO. 3-00-114-39794			SCALE : N.T.S. 		—		
				SHEET 01 OF 01		REV 02	



CONTROL CABLE GROUPING CHART:

ITEM	CABLE SIZE	QTY/ESP
OPACITY MONITOR CONTROL SUPPLY	1X3C-1.5	1



FOR TENDER PURPOSE ONLY

CUSTOMER NO: R377



मेकॉन लिमिटेड
MECON LIMITED

CUSTOMER NO. :



NTPC-SAIL POWER COMPANY PVT. LTD.
NSPCL ROURKELA 1x250MW
STEAM GENERATOR WITH ELECTROSTATIC PRECIPITATOR PACKAGE



BHARAT HEAVY ELECTRICALS LIMITED,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET:632 406.

DEPT
CODE
M

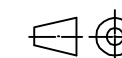
	NAME	SIGN	DATE
DRN	S.PRAKASH.	<i>S. Prakash</i>	13.10.2016
DESN	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
CHD	D.SREERAMULU	<i>D. Sreeramulu</i>	13.10.2016
APPD	M.J.M	<i>M. J. M</i>	13.10.2016

TITLE: P&C CIRCUIT FOR OPACITY MONITOR

BHEL/BAP DRG.NO.

3-00-114-39797

SCALE : N.T.S



SHEET 01 OF 01

REV 02

REV	DATE	ALTD	CHD	APPD
02	28.07.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				
01	31.05.17	A K P	A K P	M J M
REVISED BASED ON CUSTOMER FEEDBACK				

PE-DM-427-145-I002

DRIVE CONTROL PHILOSOPHY (STATION C&I)

REV	DATED	ALTD	CHR	APPD
03	16/01/2017			

01	REVISED IN-LINE WITH APPROVED LT CABLE DM AND AS PER SYSTEM REQUIREMENT.			
----	--	--	--	--

REV	DATED	ALTD	CHD	APPD
02	05/11/2016			

01	REVISED IN-LINE WITH CUSTOMER /CONSULTANT COMMENTS, DATED:- 20/09/2016.			
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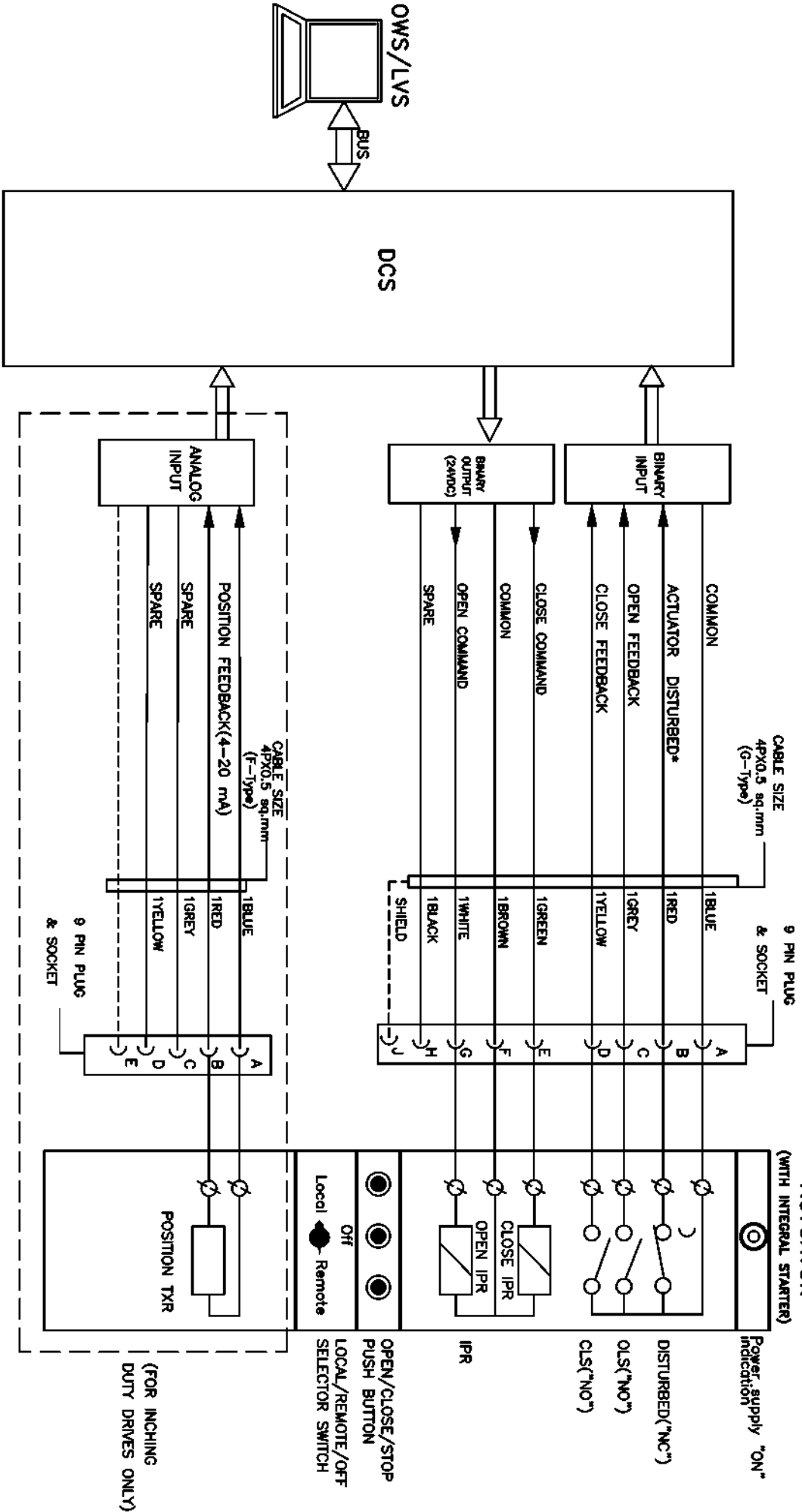
CUSTOMER	NTPC-SAIL POWER COMPANY (P) LIMITED
PROJECT	ROURKELA PP-II EXPANSION(1X250MW)
CONSULTANT	MECON LIMITED

REV	DATED	ALTD	CHD	APPD
01	12/09/2016			

01	REVISED IN-LINE WITH CUSTOMER /CONSULTANT COMMENTS, DATED:- 31/08/2016.			
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CONTRACTOR	NTPC LTD THIRU VELLORE ELECTRONICS LAB PROJECTS ENGINEERING MANAGEMENT POWER SECTOR KODAI	DEPT CODE I	NAME KGM	SIGN --SD--	DATE 03.08.16
TITLE	DRIVE CONTROL PHILOSOPHY (STATION C&I)				
DRG. NO.	PE-DM-427-145-I002				
	JOB NO.: 427	SHEET 01 OF 14	REV 03		

DCS INTERFACE FOR (BIDIRECTIONAL DRIVE WITH INTEGRAL STARTER) (BID/BIDI)



NOTE:

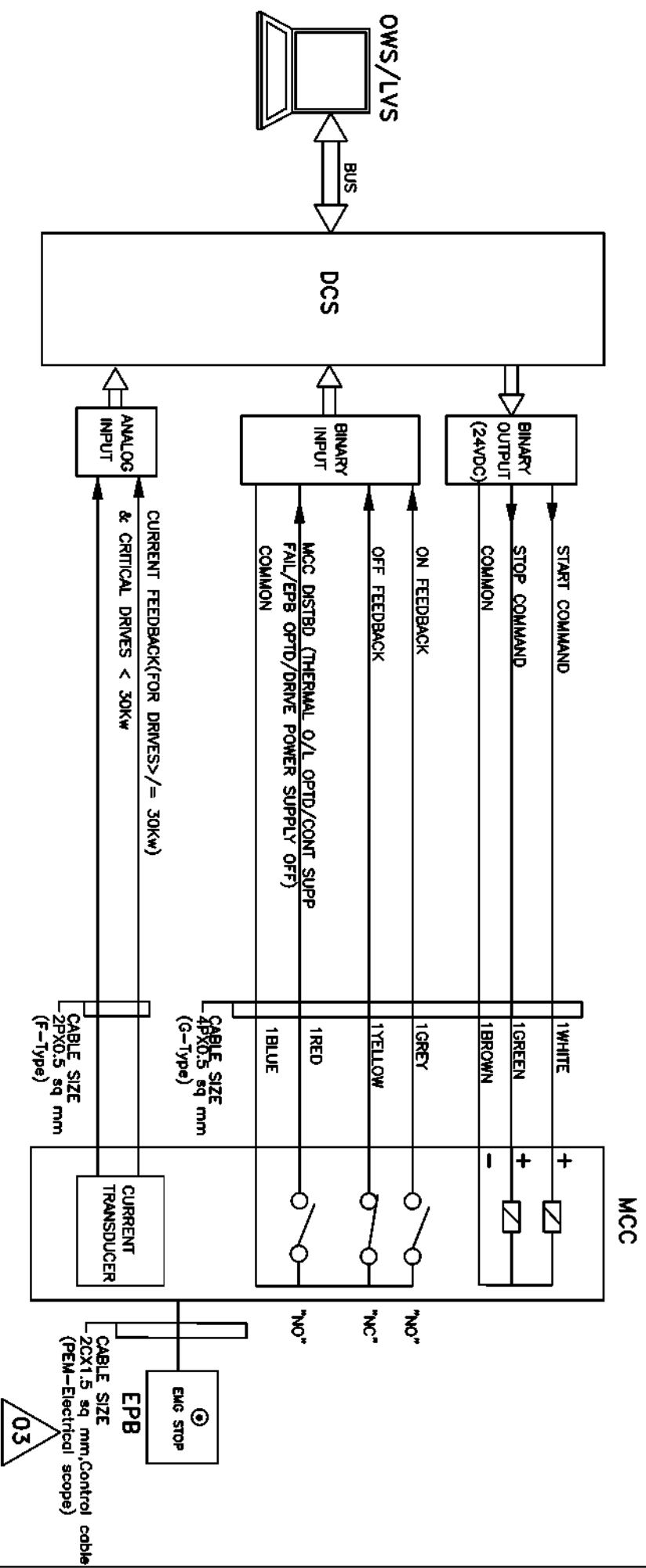
* DISTURBED= Loss of Power supply (1 Phase/3 Phase)/
Loss of control supply/ Motor thermostat trip/
Thermal over load/Torque open/close cut off/
Local/Off/Remote Sel. switch in local or off mode/
Stop PB operated.

01



PROJECT: ROURKELA PP-II EXPANSION (1X250MW)		DRG.NO.	PE-DM-427-145-1002
TITLE		DATE	16.01.2017
DDCMS INTERFACE FOR		REV.NO.	03
BIDIRECTIONAL DRIVE		SHT	7 OF 14

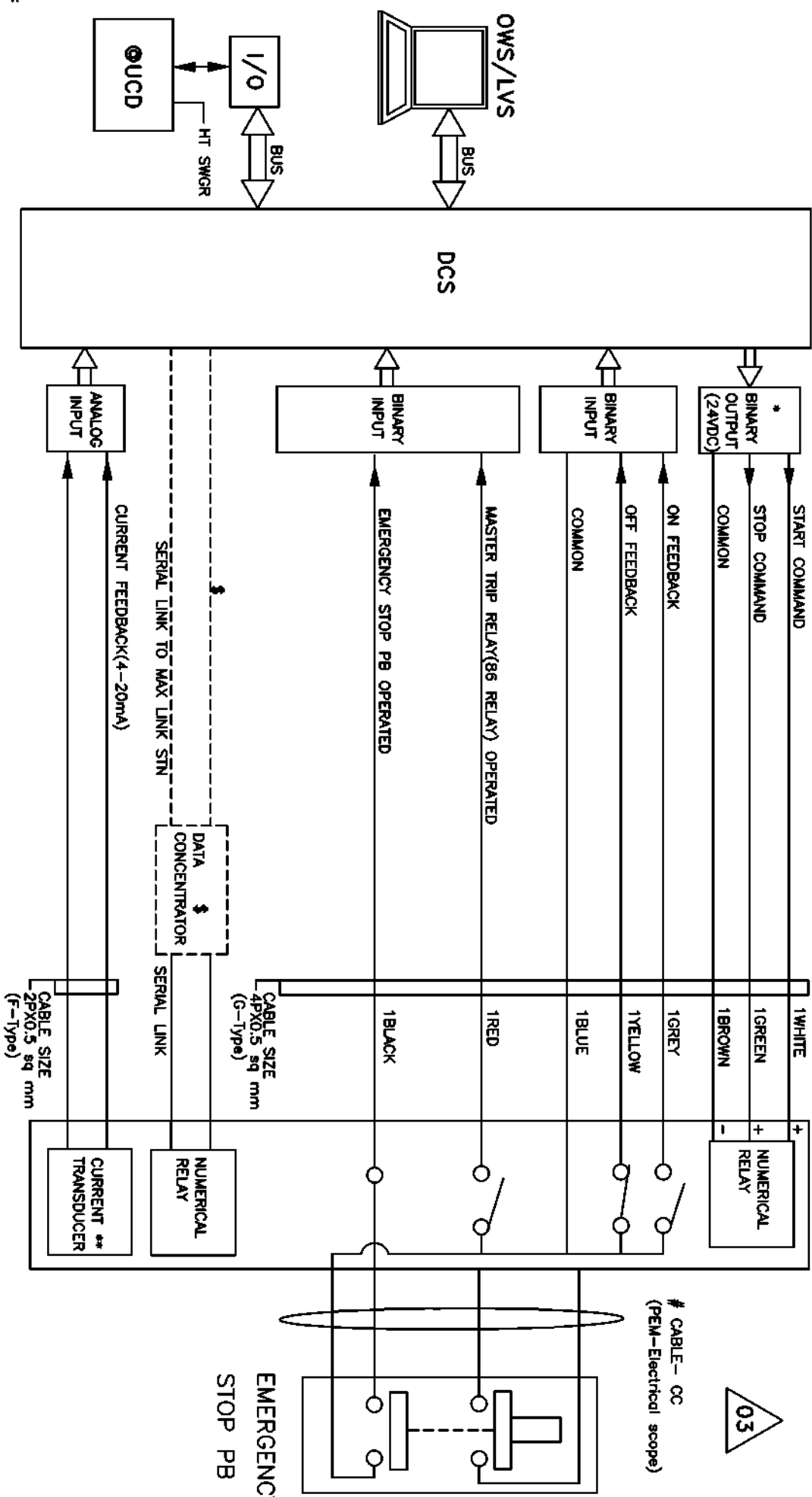
DCS INTERFACE FOR UNIDIRECTIONAL LT DRIVE (CONTACTOR CONTROLLED) (LTUD)



PROJECT: ROURKELA PP-II EXPANSION (1X250MW)
TITLE: DDCMIS INTERFACE FOR UNIDIRECTIONAL LT DRIVE

DRG. NO.	PE-DM-427-145-1002
DATE	16.01.2017
REV. NO.	03
SHT	8 OF 14

DCS INTERFACE FOR HT/LT UNIDIRECTIONAL DRIVES (BREAKER OPERATED) (HTUD/LTUD) SWGR



PROJECT: ROURKELA PP-II EXPANSION (1X250MW)		DRG. NO.	PE-DM-427-145-1002
TITLE		DATE	16.01.2017
DDCMS INTERFACE FOR UNIDIRECTIONAL HT DRIVE		REV. NO.	03
		SHT	10 OF 14



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-A)**

SPECIFICATION NO. EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 28.05.2018

SHEET : 1 OF 1

**ANNEXURE-A
MAIN PRICE SCHEDULE**



sl.no	MATL.CODE	DESCRIPTION	RATING	UNIT	QTY	UNIT PRICE	TOTAL
1	ELNSPCLBAP01	ESP SWITHGEAR PANEL DFDO	3200A	EA	2		
2	ELNSPCLISG01	AHP PMCC-1	4000A	EA	1		
3	ELNSPCLISG02	AHP PMCC-2	2000A	EA	1		
4	ELNSPCLISG03	CHP PMCC-1	4000A	EA	1		
5	ELNSPCLISG04	CHP PMCC-2	2500A	EA	1		
6	ELNSPCLISG05	CHP PMCC-3	1600A	EA	1		
7	ELNSPCLISG06	MANDATORY SPARE FOR CHP & AHP ANNEX F1		SET	1		
8	ELNSPCLBAP02	MANDATORY SPARE FOR ESP SWG - ANNEX F2		SET	1		
9	ELNSPCLISG07	E&C SPARE FOR CHP & AHP ANNEX E1		SET	1		
10	ELNSPCLBAP03	E&C SPARE FOR ESP SWG ANNEX E2		SET	1		
11	ELNSPCLISG08	SITE MODIFICATION CHARGES ANNEX G		SET	1		
12	ELNSPCLISG09	NUMERICAL RELAY COMMISSIONING CHARGES		SET	1		
12	ELNSPCLISG10	TOOLS & TACKLES ANNEX I		SET	1		
12	ELNSPCLTBG10	MLDB FOR TBG		EA	1		
12	ELNSPCLTBG11	ELDB FOR TBG		EA	1		
12	ELNSPCLTBG12	EPDB FOR TBG		EA	1		

TOTAL

NOTES:
1. SUMMATION OF ALL UNIT RATES OF MODULES SHALL BE EQUIVALENT TO TOTAL BOARD COST QUOTED, VARIANCE OF +/- 5% IS ACCEPTABLE. BEYOND 5% OFFER WILL NOT BE CONSIDER AS VALID OFFER. IN UNIT ADDITION-DELETION PRICES, PRICES QUOTED FOR COMPONENTS SHALL BE AS PER LIST PRICE OF CONCERNED MANUFACTURES. IF ANY ABNORMAL PRICES ON HIGHER SIDE OBSERVED OFFER MAY BE REJECTED.
2. ALL LT PCC/ MCC/ DBs SHALL BE SUPPLIED ALONGWITH THE INTEGRAL BASE FRAMES, FOUNDATION BOLTS, CABLE GLANDS & LUGS AND TOOLS & TACKLES AS MENTIONED IN DIFFERENT SECTIONS. ALL FIXING NUTS & BOLTS TOGETHER WITH FOUNDATION BOLTS SHALL ALSO BE SUPPLIED. PRICES FOR THE BASE FRAME SHALL BE BUILT IN THE SWITCHBOARD PRICE.
3. ITEM WISE PRICES WITH DESCRIPTION AND RATING OF EACH ITEM COMPLYING TO LIST FURNISHED IN THE SCHEDULE OF UNIT PRICES SHALL BE FURNISHED IN SCHEDULE OF UNIT PRICE.
4. FOR DETAILED BOARD WISE BOM, REFER ANNEXURE-B.
5. FOR DETAILED MODULE WISE BOM, REFER ANNEXURE-C.
6. LIST OF RECOMMENDED O&M SPARES FOR 3 YEARS (OPTIONAL) WITH ITEM WISE PRICE & QUANTITY OF EACH ITEM AS RECOMMENDED BY MANUFACTURER SHALL BE FURNISHED IN SCHEDULE OF PRICES.
7. ADDITION/DELETION OF QUANTITIES SHALL BE APPLICABLE AT THE QUOTED PRICE. THE UNIT RATE OF SUPPLY OF ALL EQUIPMENTS & SERVICES QUOTED BY THE BIDDER SHALL BE FIRM FOR A VARIATION OF QUANTITIES, WHICH MAY BE TO THE EXTENT OF ±30% OF THE TOTAL CONTRACT VALUE DERIVED ON THE BASIS OF ORDERED QUANTITY. SUM OF INDIVIDUAL MODULE SHALL EQUAL TO BOARD PRICE.
8. Price of components for Panels, Busduct, E&C spres, Tools and Tackles are to be quoted in Unit Price Schedule given in specification.
a. COMPLETE DIMENSIONS OF ALL THE BOARDS INCLUDING NO OF ACB, MCC. GA DRAWING SHALL BE DULY SUBMITTED FOR ALL BOARDS.
b. DIMENSIONS OF EACH TYPE OF PANEL.
c. MODULE SIZE OF EACH TYPE OF FEEDER.
d. MINIMUM CLEARANCES REQUIRED ON ALL SIDES FOR EACH TYPE OF PANEL.
e. NO. of VERTICAL (including PCC, MCC etc.) of EACH PANLES TO BE GIVEN, ELSE YOUR OFFER WILL BE REJECTED..
9. DOUBLE COMPRESSION, NICKLE PLATED BRASS CABLE GLANDS & HEAVY DUTY LUGS OF NTPC APPROVED MAKE FOR EXTERNAL POWER, CONTROL & EARTHING CONNECTIONS AT SUPPLIED EQUIPMENT END AND FOUNDATION BOLT ARE IN THE SCOPE OF BIDDER. BIDDER TO QUOTE ALL EQUIPMENT WITH CABLE GLANDS, LUGS AND FOUNDATION BOLTS.



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-B)**

SPECIFICATION NO. EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 28.05.2018

SHEET : 1 OF 1

ANNEXURE-B

BOARDWISE BILL OF MATERIAL



Name of the Board: ESP SWITCHGEAR PANEL											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	SELECTED CABLE SIZE	SECTION	MODULE TYPE
1	ESP	INCOMER	INCOMER-1	1	3200	ACB	A	415	BUS DUCT	A	DAET-I/C
2	ESP	INCOMER	INCOMER-2	1	3200	ACB	A	415	BUS DUCT	B	DAET-I/C
3	ESP	BUSCOUPLER	BUS COUPLER	1	3200	ACB	A	415	NA	NA	DAET-B/C
4	ESP		AC & VENTILLATION MCC	1	630	ACB	A	415	3RX1CX630 AI 1RX1CX300 AI	A	DAE-O/G
5	ESP		MLDB	1	400/250	SFU	A	415	3CX240 AI	A	E3
6	ESP		VFD ID FAN-1A	1	250/150	SFU	A	415	3CX70 AI	A	E3
7	ESP		RAPING MOTOR	18	0.37	DOL	KW	415	3CX2.5 AI	A	RM
8	ESP		HOPPER HEATER	9	12	HEATER	KW	415	3CX10 AI	A	HH
9	ESP		SUPPORT INSULATOR HEATER	2	28	HEATER	KW	415	3CX35 AI	A	HI
10	ESP		SHAFT INSULATOR HEATER	2	7	HEATER	KW	415	3CX10 AI	A	HS
11	ESP		DUST DENSITY MONITOR	1	2X1.1	DOL	KW	415	3CX2.5 AI	A	DDM
12	ESP		CONTROL SUPPLY	1	5	CST	KVA	415		A	CS-A
13	ESP		SPACE HEATER SUPPLY	1	3	SH	KVA	415		A	SH
14	ESP		ASH LEVEL INDICATOR (LOW)	1	32/6	ALI	A	240		A	ALI(L)
15	ESP		ASH LEVEL INDICATOR(HIGH)	1	32/6	ALI	A	240		A	ALI(H)
16	ESP		EOH	1	63/32	SFU	A	415	3CX10 AI	A	E3
17	ESP		ELECTRONIC CONTROLLER	9	400/320	SFU	A	415	2RX2CX120 AI	A	E2
18	ESP		BUS PT	1						A	G1
19	ESP		ARECA MARSHALLING MODULE	1						A	ARECA
20	ESP		MARSHALING MODULE FOR SSPB OF RAPING MOTOR AND HOPPER HEATER FEEDBACK	1						A	MM
21	ESP		ELECTRONIC CONTROLLER	8	400/320	SFU	A	415	2RX2CX120 AI	B	E2
22	ESP		EOH	1	63/32	SFU	A	415	3CX10 AI	B	E3
23	ESP		ASH LEVEL INDICATOR (LOW)	1	32/6	ALI	A	240		B	ALI(L)
24	ESP		ASH LEVEL INDICATOR(HIGH)	1	32/6	ALI	A	240		B	ALI(H)
25	ESP		CONTROL SUPPLY	1	5	CST	KVA	415		B	CS-A
26	ESP		SPACE HEATER SUPPLY	1	3	SH	KVA	415		B	SH
27	ESP		HOPPER HEATER	8	12	HEATER	KW	415	3CX10 AI	B	HH
28	ESP		SUPPORT INSULATOR HEATER	1	28	HEATER	KW	415	3CX35 AI	B	HI
29	ESP		SHAFT INSULATOR HEATER	1	7	HEATER	KW	415	3CX10 AI	B	HS
30	ESP		DUST DENSITY MONITOR	1	2X1.1	DOL	KW	415	3CX2.5 AI	B	DDM
31	ESP		VFD ID FAN-1A	1	250/150	SFU	A	415	3CX70 AI	B	E3
32	ESP		RAPING MOTOR	18	0.37	DOL	KW	415	3CX2.5 AI	B	RM
33	ESP		BUS PT	1						B	G1
34	ESP		ARECA MARSHALLING MODULE	1						B	ARECA
35	ESP		MARSHALING MODULE FOR SSPB OF RAPING MOTOR AND HOPPER HEATER FEEDBACK	1						B	MM
36	ESP		ACB I/C PANELS		3200/3200A						
37	ESP		ACB O/G PANELS		3200/630A						
38	ESP		MCC DFD0		3200/630A						
39			ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: AHP AREA (AHP-MCC-1)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT DIO TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	CABLE	SECTION	MODULE TYPE
1	AHP	INCOMER	INCOMER-1	1	4000.0	ACB	A	415	BUS DUCT	A	DAET-I/C
2	AHP	INCOMER	INCOMER-2	1	4000.0	ACB	A	415	BUS DUCT	B	DAET-I/C
3	AHP	BUSCOUPLER	BUS COUPLER	1	4000.0	ACB	A	415	NA	NA	DAET-B/C
4	AHP	Future	Future Use-1	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
5	AHP	ILL	Illumination-1-W	1	250.0	SFU	A	415	1RX3CX185 AI	A	E3
6	AHP	ILL	Illumination-1-S	1	250.0	SFU	A	415	1RX3CX185 AI	B	E3
7	AHP	Future	Future Use-2	1	32.0	SFU	A	415	1RX4CX35 AI	B	E3
8	AHP	AUX	Auxiliary Power Supply for LT Transformer-1	1	6.0	SFU	A	240	1RX2CX2.5 Cu	A	E3
9	AHP	AUX	Auxiliary Power Supply for LT Transformer-2	1	6.0	SFU	A	240	1RX2CX2.5 Cu	B	E3
10	AHP	AUX	Bus Duct-1 Auxiliary Power Supply	1	16	SFU	A	240	1RX2CX6 AI	A	E3
11	AHP	AUX	Bus Duct-2 Auxiliary Power Supply	1	16	SFU	A	240	1RX2CX6 AI	B	E3
12	AHP	BC	220 V DC Battery Charger-1	1	63.0	SFU	A	415	1RX3.5CX50 AI	A	E3
13	AHP	BC	220V DC Battery Charger-2	1	63.0	SFU	A	415	1RX3.5CX50 AI	B	E3
14	AHP	BC	24 V DC Battery Charger-1	1	125.0	SFU	A	415	1RX3CX25 AI	A	E3
15	AHP	BC	24 V DC Battery Charger-2	1	125.0	SFU	A	415	1RX3CX25 AI	B	E3
16	AHP	Future	Future Use-3	1	16.0	SFU	A	415	1RX4CX10 AI	B	E3
17	AHP	UPS	UPS Power Supply-W	1	32.0	SFU	A	415	1RX4CX16 AI	A	E3
18	AHP	UPS	UPS Power Supply-S	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
19	AHP	WDB	Welding DB Power Supply-1	1	250.0	SFU	A	415	1RX3CX185 AI	A	E3
20	AHP	WDB	Welding DB Power Supply-2	1	250.0	SFU	A	415	1RX3CX185 AI	B	E3
21	AHP	AC	Air Conditioning RIO room	1	63.0	SFU	A	415	1RX3.5CX50 AI	A	E3
22	AHP	AC	Air Conditioning Control room room	1	63.0	SFU	A	415	1RX3.5CX50 AI	B	E3
23	AHP	LPSWP	LP seal water pump-1-W	1	15.0	DOL	KW	415	1RX3CX35 AI	A	DK2
24	AHP	LPSWP	LP seal water pump-1-S	1	15.0	DOL	KW	415	1RX3CX16 AI	B	DK2
25	AHP	FAWP	FA Water Pump-1-W	1	18.5	DOL	KW	415	1RX3CX25 AI	A	DK2
26	AHP	FAWP	FA Water Pump-1-S	1	18.5	DOL	KW	415	1RX3CX25 AI	B	DK2
27	AHP	LPWP	LP Water Pump-1-W	1	45.0	DOL	KW	415	1RX3CX95 AI	A	DK21
28	AHP	LPWP	LP Water Pump-1-S	1	45.0	DOL	KW	415	1RX3CX95 AI	B	DK21
29	AHP	FWP	Flushing water pump-1-W	1	45.0	DOL	KW	415	1RX3CX95 AI	A	DK21
30	AHP	FB	ESP & IA silo Fluidizing blower-1-W	1	15.0	DOL	KW	415	1RX3CX16 AI	A	DK2
31	AHP	FB	ESP & IA silo Fluidizing blower-2-W	1	15.0	DOL	KW	415	1RX3CX16 AI	A	DK2
32	AHP	FB	ESP & IA silo Fluidizing blower-1-S	1	15.0	DOL	KW	415	1RX3CX16 AI	B	DK2
33	AHP	AH	Air heater for ESP & IA silo Blower-1-W	1	63.0	SFU	A	415	1RX4CX25 AI	A	E3
34	AHP	AH	Air heater for ESP & IA silo Blower-2-W	1	63.0	SFU	A	415	1RX4CX25 AI	B	E3
35	AHP	AH	Air heater for ESP & IA silo Blower-1-S	1	63.0	SFU	A	415	1RX4CX25 AI	A	E3
36	AHP	CRANE	EOT crane for Ash water Pump House-1-W	1	63.0	SFU	A	415	1RX4CX10 AI	A	E3
37	AHP	HPSWP	HP seal water pump-1-W	1	18.5	DOL	KW	415	1RX3CX25 AI	A	DK2
38	AHP	HPSWP	HP seal water pump-1-S	1	18.5	DOL	KW	415	1RX3CX25 AI	B	DK2
39	AHP	ASDP	Ash Slurry disposal pumps-1-W	1	200.0	ACB	KW	415	2RX3CX185 AI	A	DM
40	AHP	ASDP	Ash Slurry disposal pumps-2-W	1	200.0	ACB	KW	415	2RX3CX185 AI	A	DM
41	AHP	ASDP	Ash Slurry disposal pumps-3-W	1	200.0	ACB	KW	415	2RX3CX185 AI	B	DM
42	AHP	ASDP	Ash Slurry disposal pumps-1-S	1	200.0	ACB	KW	415	2RX3CX185 AI	A	DM
43	AHP	ASDP	Ash Slurry disposal pumps-2-S	1	200.0	ACB	KW	415	2RX3CX185 AI	A	DM
44	AHP	ASDP	Ash Slurry disposal pumps-3-S	1	200.0	ACB	KW	415	2RX3CX185 AI	B	DM
45	AHP	ASDP	Ash Slurry disposal pumps-4-S	1	200.0	ACB	KW	415	2RX3CX185 AI	B	DM
46	AHP	ASDP	Ash Slurry disposal pumps-5-S	1	200.0	ACB	KW	415	2RX3CX185 AI	B	DM
47	AHP	ASDP	Ash Slurry disposal pumps-6-S	1	200.0	ACB	KW	415	2RX3CX185 AI	B	DM
48	AHP	ASDP	Oil pump for Fluid Coupling for 1st stage ASDP-1-W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
49	AHP	ASDP	Oil pump for Fluid Coupling for 1st stage ASDP-1-S	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
50	AHP	ASDP	Oil pump for Fluid Coupling for 1st stage ASDP-2-S	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
51	AHP	DP	Drain pump in ASD pumphouse-1-W	1	5.5	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
52	AHP	DP	Drain pump in ASD pumphouse-1-S	1	5.5	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
53	AHP	TSC	Motor for Tube settler clarifoculator	1	7.5	DOL	KW	415	1RX3CX10 AI	A	DK2
54	AHP	CRANE	EOT crane for Ash Slurry Pump House-1-W	1	63.0	SFU	A	415	1RX4CX10 AI	B	E3
55	AHP	CG	Clinker Grinder-1-W	1	11.0	RDOL	KW	415	1RX3CX25 AI	A	DN1
56	AHP	CG	Clinker Grinder-2-W	1	11.0	RDOL	KW	415	1RX3CX25 AI	A	DN1
57	AHP	CG	Clinker Grinder-1-S	1	11.0	RDOL	KW	415	1RX3CX25 AI	B	DN1
58	AHP	CG	Clinker Grinder-2-S	1	11.0	RDOL	KW	415	1RX3CX25 AI	B	DN1
59	AHP	OFF	BA Overflow Pump-1-W	1	30.0	DOL	KW	415	1RX3CX50 AI	A	DK21
60	AHP	BAOFF	BA Overflow Pump-1-S	1	30.0	DOL	KW	415	1RX3CX50 AI	B	DK21
61	AHP	DP	Drain pump in BA Area-1-W	1	5.5	DOL	KW	415	1RX3CX10 AI	A	DK2
62	AHP	DP	Drain pump in BA Area-1-S	1	5.5	DOL	KW	415	1RX3CX10 AI	B	DK2
63	AHP	EWP	ECO Water Pump-1-W	1	22.0	DOL	KW	415	1RX3CX35 AI	A	DK2
64	AHP	EWP	ECO Water Pump-1-S	1	22.0	DOL	KW	415	1RX3CX35 AI	B	DK2
65	AHP	TAC	Transport air compressor 1st stage-1-W	1	200.0	ACB	KW	415	2RX3CX150 AI	A	DM
66	AHP	TAC	Transport air compressor 1st stage-2-W	1	200.0	ACB	KW	415	2RX3CX150 AI	A	DM
67	AHP	TAC	Transport air compressor 1st stage-1-S	1	200.0	ACB	KW	415	2RX3CX150 AI	B	DM
68	AHP	AUX	Auxiliary Power Supply for TAC-1 Stage-1-W	1	32.0	SFU	A	415	1RX4CX25 AI	A	E3
69	AHP	AUX	Auxiliary Power Supply for TAC-2 Stage-1-W	1	32.0	SFU	A	415	1RX4CX25 AI	B	E3
70	AHP	AUX	Auxiliary Power Supply for TAC-3 Stage-1-S	1	32.0	SFU	A	415	1RX4CX25 AI	A	E3
71	AHP	AD	Air drier for TAC 1st stage-1-W	1	23.0	SFU	A	415	1RX4CX16 AI	A	E3
72	AHP	AD	Air drier for TAC 1st stage-2-W	1	23.0	SFU	A	415	1RX4CX16 AI	B	E3
73	AHP	AD	Air drier for TAC 1st stage-1-S	1	23.0	SFU	A	415	1RX4CX16 AI	A	E3
74	AHP	AD	Air drier for TAC 2nd stage-1-W	1	32.0	SFU	A	415	1RX4CX16 AI	A	E3
75	AHP	AD	Air drier for TAC 2nd stage-2-W	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
76	AHP	AD	Air drier for TAC 2nd stage-1-S	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
77	AHP	IAC	Instrument air compressor- AHP-1-W	1	90.0	ACB	KW	415	2RX3CX185 AI	A	DM
78	AHP	IAC	Instrument air compressor- AHP-1-S	1	90.0	ACB	KW	415	2RX3CX185 AI	B	DM
79	AHP	AD	Air drier for IAC- AHP-1-W	1	32.0	SFU	A	415	1RX4CX10 AI	A	E3
80	AHP	AD	Air drier for IAC- AHP-1-S	1	32.0	SFU	A	415	1RX4CX10 AI	B	E3
81	AHP	CRANE	EOT in AHP compressor House-1-W	1	63.0	SFU	A	415	1RX4CX10 AI	A	E3
82	AHP	Future	Future Use-4	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
83	AHP	Future	Future Use-5	1	32.0	SFU	A	415	1RX4CX10 AI	B	E3
84	AHP	VF	Vent fan for IA silo-1-W	1	5.5	DOL	KW	415	1RX3CX25 AI	A	DK2
85	AHP	VF	Vent fan for IA silo-2-W	1	5.5	DOL	KW	415	1RX3CX25 AI	B	DK2
86	AHP	HOIST	Electric hoist for IA silo-1-W	1	32.0	SFU	A	415	1RX4CX16 AI	A	E3
87	AHP	HOIST	Electric hoist for IA silo-2-W	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
88	AHP	DP	Drain Pump in ESP area-W	1	7.5	DOL	KW	415	1RX3CX10 AI	A	DK2
89	AHP	DP	Drain Pump in ESP area-S	1	7.5	DOL	KW	415	1RX3CX10 AI	B	DK2
90	AHP	AUX	Auxiliary Power Supply for IAC-1-W	1	32.0	SFU	A	415	1RX4CX25 AI	A	E3



Name of the Board: AHP AREA (AHP-MCC-1)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT DIO TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	CABLE	SECTION	MODULE TYPE
91	AHP	AUX	Auxiliary Power Supply for IAC-2-S	1	32.0	SFU	A	415	1RX4CX25 AI	B	E3
92	AHP	BAUP	Bottom Ash Unloading Panel-1W	1	16.0	SFU	A	240	1RX2CX35 AI	A	E3
93	AHP	PANEL	Bottom Ash Unloading Panel-2W	1	16.0	SFU	A	240	1RX2CX35 AI	B	E3
94	AHP	PANEL	Control Supply Panel for instruments-1W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
95	AHP	PANEL	Control Supply Panel for instrumnts-2W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
96	AHP	PANEL	Control Supply Panel for instruments-1W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
97	AHP	PANEL	Control Supply Panel for instruments-2W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
98	AHP	PANEL	Control Supply Panel for instruments-3W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
99	AHP	PANEL	Control Supply Panel for instruments-4W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
100	AHP	PANEL	Control Supply Panel for instruments-5W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
101	AHP	PANEL	Control Supply Panel for instruments-6W	1	16.0	SFU	A	240	1RX2CX16 AI	A	E3
102	AHP	PANEL	Control Supply Panel for instruments-7W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
103	AHP	PANEL	Control Supply Panel for instruments-8W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
104	AHP	PANEL	Control Supply Panel for instruments-9W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
105	AHP	PANEL	Control Supply Panel for instruments-10W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
106	AHP	PANEL	Control Supply Panel for instruments-11W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
107	AHP	PANEL	Control Supply Panel for instruments-12W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
108	AHP	PANEL	Control Supply Panel for instruments-1W	1	16.0	SFU	A	240	1RX2CX35 AI	A	E3
109	AHP	PANEL	Control Supply Panel for instruments-2W	1	16.0	SFU	A	240	1RX2CX16 AI	B	E3
110	AHP	UPS	UPS Bypass Power Supply feeder	1	32.0	SFU	A	240	1RX2CX16 AI	B	E3
111	AHP	Future	Future use-6	1	32.0	SFU	A	415	1RX4CX10 AI	B	E3
112	AHP	AUX	Auxiliary Power Supply for TAC-1 Stage-2-W	1	63.0	SFU	A	415	1RX4CX25 AI	A	E3
113	AHP	AUX	Auxiliary Power Supply for TAC-2 Stage-2-W	1	63.0	SFU	A	415	1RX4CX25 AI	B	E3
114	AHP	AUX	Auxiliary Power Supply for TAC-3 Stage-2-S	1	63.0	SFU	A	415	1RX4CX25 AI	A	E3
115	AHP	VS	Supply Air Fan-1W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
116	AHP	VS	Supply Air Fan-2W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
117	AHP	VS	Supply Air Fan-3W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
118	AHP	VS	Supply Air Fan-4W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
119	AHP	VS	Exhaust Air Fan-1W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
120	AHP	VS	Exhaust Air Fan-2W- AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
121	AHP	VS	Exhaust Air Fan-3W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
122	AHP	VS	Exhaust Air Fan-4W - AHP MCC room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
123	AHP	VS	Exhaust Air Fan-1W- Battery room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
124	AHP	VS	Exhaust Air Fan-2W - Battery room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
125	AHP	VS	Ventilation Fan-1W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
126	AHP	VS	Ventilation Fan-2W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
127	AHP	VS	Ventilation Fan-3W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
128	AHP	VS	Ventilation Fan-4W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
129	AHP	VS	Ventilation Fan-5W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
130	AHP	VS	Ventilation Fan-6W - Compressor cum AWPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
131	AHP	VS	Ventilation Fan-1W- ASPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
132	AHP	VS	Ventilation Fan-2W - ASPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
133	AHP	VS	Ventilation Fan-3W - ASPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
134	AHP	VS	Ventilation Fan-4W - ASPH	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
135	AHP		SPARE	5	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
136	AHP		SPARE	2	5.5	DOL	KW	415	1RX3CX25 AI	B	DK2
137	AHP		SPARE	2	7.5	DOL	KW	415	1RX3CX10 AI	B	DK2
138	AHP		SPARE	2	15.0	DOL	KW	415	1RX3CX16 AI	B	DK2
139	AHP		SPARE	2	18.5	DOL	KW	415	1RX3CX25 AI	B	DK2
140	AHP		SPARE	1	22.0	DOL	KW	415	1RX3CX35 AI	B	DK2
141	AHP		SPARE	1	45.0	DOL	KW	415	1RX3CX95 AI	A	DK21
142	AHP		SPARE	1	30.0	DOL	KW	415	1RX3CX50 AI	B	DK21
143	AHP		SPARE	3	200.0	ACB	KW	415	2RX3CX150 AI	B	DM
144	AHP		SPARE	1	90.0	ACB	KW	415	2RX3CX185 AI	A	DM
145	AHP		SPARE	1	11.0	RDOL	KW	415	1RX3CX25 AI	B	DN1
146	AHP		SPARE	6	16.0	SFU	A	240	1RX2CX16 AI	B	E3
147	AHP		SPARE	6	32.0	SFU	A	415	1RX4CX10 AI	B	E3
148	AHP		SPARE	3	63.0	SFU	A	415	1RX4CX25 AI	A	E3
149	AHP		SPARE	1	125.0	SFU	A	415	1RX3CX25 AI	B	E3
150	AHP		SPARE	1	250.0	SFU	A	415	1RX3CX185 AI	B	E3
151	AHP		CONTROL SUPPLY	2	3.0		KVA				CS
152	AHP		BUS PT	2							G1
153	AHP		ACB I/C PANELS	3	4000/4000A						
154	AHP		ACB O/G PANELS	13	4000/630A						
155	AHP		MCC DFDO	17	4000A/630A						
156	AHP		ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: FA SILO & HCSD AREA (AHP-MCC-2 NEAR HCSD PUMP HOUSE)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	CABLE	SECTION	MODULE TYPE
1	SILO	INCOMER	INCOMER-1	1	2000.0	ACB	A	415	BUS DUCT	A	DAET-I/C
2	SILO	INCOMER	INCOMER-2	1	2000.0	ACB	A	415	BUS DUCT	B	DAET-I/C
3	SILO	BUSCOUPLER	BUS COUPLER	1	2000.0	ACB	A	415	NA	NA	DAET-B/C
4	SILO	WDB	Welding DB Power Supply-1	1	250.0	SFU	A	415	1RX3CX185 AI	A	E3
5	SILO	WDB	Welding DB Power Supply-2	1	250.0	SFU	A	415	1RX3CX185 AI	B	E3
6	SILO	UPS	UPS Power Supply-W	1	63.0	SFU	A	415	1RX4CX16 AI	A	E3
7	SILO	UPS	UPS Power Supply-S	1	63.0	SFU	A	415	1RX4CX16 AI	B	E3
8	SILO	Future	Future Use-5	1	63.0	SFU	A	415	1RX4CX35 AI	B	E3
9	SILO	AUX	Auxiliary Power Supply for LT Transformer-1	1	6.0	SFU	A	240	1RX2CX2.5 Cu	A	E3
10	SILO	AUX	Auxiliary Power Supply for LT Transformer-2	1	6.0	SFU	A	240	1RX2CX2.5 Cu	B	E3
11	SILO	AUX	Auxiliary Power Supply for LT Transformer (HCSD VFD)-1	1	6.0	SFU	A	240	1RX2CX2.5 Cu	A	E3
12	SILO	AUX	Auxiliary Power Supply for LT Transformer (HCSD VFD)-2	1	6.0	SFU	A	240	1RX2CX2.5 Cu	B	E3
13	SILO	BC	24 V DC Battery Charger-1	1	63.0	SFU	A	415	1RX4CX10 AI	A	E3
14	SILO	BC	24 V DC Battery Charger-2	1	63.0	SFU	A	415	1RX4CX10 AI	B	E3
15	SILO	AUX	Bus Duct-1 Auxiliary Power Supply	1	16	SFU	A	240	1RX2CX10 AI	A	E3
16	SILO	AUX	Bus Duct-2 Auxiliary Power Supply	1	16	SFU	A	240	1RX2CX10 AI	B	E3
17	SILO	AC	Air Conditioner -1-W	1	63.0	SFU	A	415	1RX4CX16 AI	B	E3
18	SILO	ILL	Illumination-1-W	1	250.0	SFU	A	415	1RX3CX185 AI	A	E3
19	SILO	ILL	Illumination-1-S	1	250.0	SFU	A	415	1RX3CX185 AI	B	E3
20	SILO	ACWP	Ash Conditioner water pump-1-W	1	15.0	DOL	KW	415	1RX3CX16 AI	A	DK2
21	SILO	ACWP	Ash Conditioner water pump-2-W	1	15.0	DOL	KW	415	1RX3CX16 AI	B	DK2
22	SILO	ACWP	Ash Conditioner water pump-1-S	1	15.0	DOL	KW	415	1RX3CX16 AI	A	DK2
23	SILO	DP	Drain pump near silo area-1-W	1	11.0	DOL	KW	415	1RX3CX10 AI	A	DK2
24	SILO	DP	Drain pump near silo area-1-S	1	11.0	DOL	KW	415	1RX3CX10 AI	B	DK2
25	SILO	CP	Charge pump-1-W	1	90.0	ACB	KW	415	1RX3CX185 AI	A	DM
26	SILO	CP	Charge pump-1-S	1	90.0	ACB	KW	415	1RX3CX185 AI	B	DM
27	SILO	ASHC	Ash conditioner Motor-1-W	1	22.0	DOL	KW	415	1RX3CX35 AI	A	DK2
28	SILO	ASHC	Ash conditioner Motor-2-S	1	22.0	DOL	KW	415	1RX3CX35 AI	B	DK2
29	SILO	ASHM	Ash mixer-1-W	1	22.0	DOL	KW	415	1RX3CX35 AI	A	DK2
30	SILO	SWP	HCSD seal water pump-1-W	1	5.5	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
31	SILO	SWP	HCSD seal water pump-1-S	1	5.5	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
32	SILO	FASFB	Fly ash silo fluidizing blower-1-W	1	45.0	DOL	KW	415	1RX3CX95 AI	A	DK21
33	SILO	FASFB	Fly ash silo fluidizing blower-2-W	1	45.0	DOL	KW	415	1RX3CX95 AI	B	DK21
34	SILO	FASFB	Fly ash silo fluidizing blower-1-S	1	45.0	DOL	KW	415	1RX3CX95 AI	A	DK21
35	SILO	FASFB	Fly ash silo fluidizing blower-2-S	1	45.0	DOL	KW	415	1RX3CX95 AI	B	DK21
36	SILO	AH	Air heater for FA Silo Blower-1-W	1	63.0	SFU	A	415	1RX4CX10 AI	A	E3
37	SILO	AH	Air heater for FA Silo Blower-2-W	1	63.0	SFU	A	415	1RX4CX10 AI	B	E3
38	SILO	AH	Air heater for FA Silo Blower-1-S	1	63.0	SFU	A	415	1RX4CX10 AI	A	E3
39	SILO	AH	Air heater for FA Silo Blower-2-S	1	63.0	SFU	A	415	1RX4CX10 AI	B	E3
40	SILO	IAC	Instrument air compressor- silo-1-W	1	75.0	DOL	KW	415	1RX3CX150 AI	A	DK21
41	SILO	IAC	Instrument air compressor- silo-1-S	1	75.0	DOL	KW	415	1RX3CX150 AI	B	DK21
42	SILO	AD	Air drier for IAC- Silo-1-W	1	32.0	SFU	A	415	1RX4CX10 AI	A	E3
43	SILO	AD	Air drier for IAC- Silo-1-S	1	32.0	SFU	A	415	1RX4CX10 AI	B	E3
44	SILO	US	Unloading Spout-1-W	1	0.55	RDOL	KW	415	1RX3CX2.5 Cu	A	DN1
45	SILO	US	Unloading Spout-2-W	1	0.55	RDOL	KW	415	1RX3CX2.5 Cu	B	DN1
46	SILO	Future	Future Use-1	1	63.0	SFU	A	415	1RX3.5CX50 AI	A	E3
47	SILO	Future	Future Use-2	1	22.0	DOL	KW	415	1RX3CX35 AI	B	DK2
48	SILO	RVF	Rotary vane feeder-1-W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
49	SILO	RVF	Rotary vane feeder-2-W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
50	SILO	RVF	Rotary vane feeder-3-W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
51	SILO	RVF	Rotary vane feeder-4-W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
52	SILO	HOIST	Electric Hoist for Silo Top-1-W	1	32.0	SFU	A	415	1RX4CX35 AI	A	E3
53	SILO	HOIST	Electric Hoist for Silo Top-2-W	1	32.0	SFU	A	415	1RX4CX35 AI	B	E3
54	SILO	VF	Vent Fans for Silo as applicable-1-W	1	11.0	DOL	KW	415	1RX3CX25 AI	A	DK2
55	SILO	VF	Vent Fans for Silo as applicable-2-W	1	11.0	DOL	KW	415	1RX3CX25 AI	B	DK2
56	SILO	VF	Vent Fans for Silo as applicable-1-S	1	11.0	DOL	KW	415	1RX3CX25 AI	A	DK2
57	SILO	VF	Vent Fans for Silo as applicable-2-S	1	11.0	DOL	KW	415	1RX3CX25 AI	B	DK2
58	SILO	Future	Future use-3	1	3.7	RDOL	KW	415	1RX3CX2.5 Cu	A	DN1
59	SILO	Future	Future use-4	1	3.7	RDOL	KW	415	1RX3CX2.5 Cu	B	DN1
60	SILO	ASHM	Ash mixer-1-S	1	22.0	DOL	KW	415	1RX3CX35 AI	B	DK2
61	SILO	AG	Agitator for ART-1-W	1	75.0	DOL	KW	415	1RX3CX150 AI	A	DK21
62	SILO	AG	Agitator for ART-1-S	1	75.0	DOL	KW	415	1RX3CX150 AI	B	DK21
63	SILO	CRANE	EOT crane for silo utility building cum HCSD pump house-1-W	1	63.0	SFU	A	415	1RX4CX25 AI	A	E3
64	SILO	Future	Future Use-6	1	32	SFU	A	415	1RX4CX2.5 Cu	A	E3
65	SILO	Future	Future Use-7	1	32	SFU	A	415	1RX4CX2.5 Cu	B	E3
66	SILO	VF	Vent fan -1W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
67	SILO	VF	Vent fan -2W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
68	SILO	US	Fan for Unloading Spout-1W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
69	SILO	US	Fan for Unloading Spout-2W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
70	SILO	PANEL	Auxiliary Power Supply for Instrument air compressor Panel- silo-1	1	32.0	SFU	A	415	1RX4CX16 AI	A	E3
71	SILO	PANEL	Auxiliary Power Supply for Instrument air compressor Panel- silo-2	1	32.0	SFU	A	415	1RX4CX16 AI	B	E3
72	SILO	DM	DOME VALVE MOTORISED-1W	1	32	SFU	KW	415	1RX4CX16 AI	A	E3
73	SILO	DM	DOME VALVE MOTORISED-2W	1	32	SFU	KW	415	1RX4CX16 AI	B	E3
74	SILO	DM	DOME VALVE MOTORISED-1S	1	32	SFU	KW	415	1RX4CX16 AI	A	E3
75	SILO	DM	DOME VALVE MOTORISED-2S	1	32	SFU	KW	415	1RX4CX16 AI	B	E3
76	SILO	FAN	BAG FILTER FAN-1W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
77	SILO	FAN	BAG FILTER FAN-2W	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
78	SILO	FAN	MOTORISED WATER VALVE-1W	1	32	SFU	A	415	1RX4CX25 AI	A	E3
79	SILO	FAN	MOTORISED WATER VALVE-2W	1	32	SFU	A	415	1RX4CX25 AI	B	E3
80	SILO	PANEL	Control Supply Panel for instruments-1W	1	32	SFU	A	240	1RX2CX35 AI	A	E3
81	SILO	PANEL	Control Supply Panel for instruments-2W	1	32	SFU	A	240	1RX2CX35 AI	B	E3
82	SILO	PANEL	Control Supply for FA Unloading Panel-1	1	32	SFU	A	240	1RX2CX35 AI	A	E3



Name of the Board: FA SILO & HCSD AREA (AHP-MCC-2 NEAR HCSD PUMP HOUSE)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	CABLE	SECTION	MODULE TYPE
83	SILO	PANEL	Control Supply for FA Unloading Panel-2	1	32	SFU	A	240	1RX2CX35 Al	B	E3
84	SILO	PANEL	Control Supply for FA Unloading Panel-3	1	32	SFU	A	240	1RX2CX35 Al	A	E3
85	SILO	PANEL	Control Supply for FA Unloading Panel-4	1	32	SFU	A	240	1RX2CX35 Al	B	E3
86	SILO	UPS	UPS Bypass Power Supply feeder	1	32.0	SFU	A	240	1RX2CX16 Al	A	E3
87	SILO	VS	Ventilation Fan-1 - HCSD cum FA Silo Utility Bldg	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
88	SILO	VS	Ventilation Fan-2 - HCSD cum FA Silo Utility Bldg	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
89	SILO	VS	Ventilation Fan-3 - HCSD cum FA Silo Utility Bldg	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
90	SILO	VS	Ventilation Fan-4 - HCSD cum FA Silo Utility Bldg	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
91	SILO	VS	Supply Air Fan-1 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
92	SILO	VS	Supply Air Fan-2 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
93	SILO	VS	Supply Air Fan-3 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
94	SILO	VS	Supply Air Fan-4 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
95	SILO	VS	Exhaust Air Fan-1 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
96	SILO	VS	Exhaust Air Fan-2 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
97	SILO	VS	Exhaust Air Fan-3 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
98	SILO	VS	Exhaust Air Fan-4 - AHP MCC-2	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	B	DK2
99	SILO	VS	Exhaust Air Fan-1 - Battery room	1	2.2	DOL	KW	415	1RX3CX2.5 Cu	A	DK2
100	SILO		SPARE	2	16	SFU	A	240	1RX2CX10 Al		E3
101	SILO		SPARE	6	32.0	SFU	A	240	1RX2CX16 Al		E3
102	SILO		SPARE	3	63.0	SFU	A	415	1RX4CX25 Al		E3
103	SILO		SPARE	1	0.55	RDOL	KW	415	1RX3CX2.5 Cu		DN1
104	SILO		SPARE	1	3.7	RDOL	KW	415	1RX3CX2.5 Cu		DN1
105	SILO		SPARE	1	250.0	SFU	A	415	1RX3CX185 Al		E3
106	SILO		SPARE	6	2.2	DOL	KW	415	1RX3CX2.5 Cu		DK2
107	SILO		SPARE	1	5.5	DOL	KW	415	1RX3CX2.5 Cu		DK2
108	SILO		SPARE	2	11.0	DOL	KW	415	1RX3CX25 Al		DK2
109	SILO		SPARE	1	15.0	DOL	KW	415	1RX3CX16 Al		DK2
110	SILO		SPARE	2	22.0	DOL	KW	415	1RX3CX35 Al		DK2
111	SILO		SPARE	2	45.0	DOL	KW	415	1RX3CX95 Al		DK21
112	SILO		SPARE	2	75.0	DOL	KW	415	1RX3CX150 Al		DK21
113	SILO		SPARE	1	90.0	ACB	KW	415	1RX3CX185 Al		DM
114	SILO		CONTROL SUPPLY	2	3.0		KVA				CS
115	SILO		BUS PT	2							G1
116	SILO		ACB I/C PANELS	3	2000/2000A						
117	SILO		ACB O/G PANELS	3	2000/630A						
118	SILO		MCC DFDO	15	2000A/630A						
119	SILO		ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: CHP AREA (CHP MCC-1 NEAR WAGON TIPPLER)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	Cable	SECTION	MODULE TYPE
1	CHP	INCOMER	INCOMER-1	1	4000	ACB	A	415	BUS DUCT	A	DAET-I/C
2	CHP	INCOMER	INCOMER-2	1	4000	ACB	A	415	BUS DUCT	B	DAET-I/C
3	CHP	BUSCOUPLER	BUS COUPLER	1	4000	ACB	A	415	NA	NA	DAET-B/C
4	CHP	UPS	UPS Power Supply-1	1	32	SFU	A	415	4CX16 Al	A	E3
5	CHP	UPS	UPS Power Supply-2	1	32	SFU	A	415	4CX16 Al	B	E3
6	CHP	UPS	Raw power supply for UPS bypass arrangement	1	32	SFU	A	240	2CX16 Al	B	E3
7	CHP	AUX	Bus Duct-1 Auxiliary Power Supply	1	16	SFU	A	240	2CX6 Al	A	E3
8	CHP	AUX	Bus Duct-2 Auxiliary Power Supply	1	16	SFU	A	240	2CX6 Al	B	E3
9	CHP	AUX	LT Transformer-1 Auxiliary Supply	1	16	SFU	A	240	2CX6 Al	A	E3
10	CHP	AUX	LT Transformer-2 Auxiliary Supply	1	16	SFU	A	240	2CX6 Al	B	E3
11	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-1	1	6	SFU	A	240	2CX2.5 Cu	A	E3
12	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-2	1	6	SFU	A	240	2CX2.5 Cu	B	E3
13	CHP	BC	24V DC Battery Charger-1	1	63	SFU	A	415	4CX10 Al	A	E3
14	CHP	BC	24V DC Battery Charger-2	1	63	SFU	A	415	4CX10 Al	B	E3
15	CHP	ILL	Illumination Power Supply-1	1	250	SFU	A	415	3.5CX185 Al	A	E3
16	CHP	ILL	Illumination Power Supply-2	1	250	SFU	A	415	3.5CX185 Al	B	E3
17	CHP	WDB	Welding DB power supply-1	1	250	SFU	A	415	3.5CX185 Al	A	E3
18	CHP	WDB	Welding DB power supply-2	1	250	SFU	A	415	3.5CX185 Al	B	E3
19	CHP	AC	Air Conditioning RIO room Power Supply	1	32	SFU	A	415	4CX16 Al	B	E3
20	CHP	BMS	Belt Monitoring System-1 at MCC-1	1	32	SFU	A	415	4CX16 Al	A	E3
21	CHP	BMS	Belt Monitoring System-2 at MCC-1	1	32	SFU	A	415	4CX16 Al	B	E3
22	CHP	FUT	Future Use	1	63	SFU	A	415	4CX2.5 Cu	B	E3
23	CHP	FF	Fire Fighting-1	1	16	SFU	A	240	2CX6 Al	A	E3
24	CHP	FF	Fire Fighting-2	1	16	SFU	A	240	2CX6 Al	B	E3
25	CHP	FUT	Future Use	1	63	SFU	A	415	3.5CX50 Al	B	E3
26	CHP	FUT	Future Use	1	100	SFU	A	415	3.5CX185 Al	B	E3
27	CHP	UPS-WT	UPS Power Supply-1	1	32	SFU	A	415	4CX16 Al	A	E3
28	CHP	UPS-WT	UPS Power Supply-2	1	32	SFU	A	415	4CX16 Al	B	E3
29	CHP	UPS-WT	Raw power supply for UPS bypass arrangement	1	32	SFU	A	240	2CX16 Al	A	E3
30	CHP	WT	Pump motor for Side arm charger Hydraulic drive-1	1	160	ACB	KW	415	2RX3CX240 Al	A	DM
31	CHP	WT	Pump motor for Side arm charger Hydraulic drive-2	1	160	ACB	KW	415	2RX3CX240 Al	B	DM
32	CHP	WT	Wagon tippler clamp motor-1	1	75	DOL	KW	415	3CX150 Al	A	DK21
33	CHP	WT	Wagon tippler clamp motor-2	1	75	DOL	KW	415	3CX150 Al	B	DK21
34	CHP	WT	Oil Cooler for Wagon tippler power pack	1	7.5	DOL	KW	415	3CX10 Al	A	DK2
35	CHP	WT	Oil Cooler for Side arm charger Hydraulic drive	1	7.5	DOL	KW	415	3CX10 Al	B	DK2
36	CHP	AFD	VFD for Apron feeder (AFD-1)	1	250	SFU	A	415	3.5CX150 Al	A	E3
37	CHP	AFD	VFD for Apron feeder (AFD-2)	1	250	SFU	A	415	3.5CX150 Al	B	E3
38	CHP	DBF	Dribble feeders (DBF-1)	1	3.7	DOL	KW	415	3CX2.5 Cu	A	DK2
39	CHP	DBF	Dribble feeders (DBF-2)	1	3.7	DOL	KW	415	3CX2.5 Cu	B	DK2
40	CHP	SP	Sump pump (SP-1&2) AT WT	1	100	SFU	A	415	4CX16 Al	A	E3
41	CHP	WT	Pump motor for Wagon tippler drive-1	1	132	ACB	KW	415	2RX3CX150 Al	A	DM
42	CHP	WT	Pump motor for Wagon tippler drive-2	1	132	ACB	KW	415	2RX3CX150 Al	B	DM
43	CHP	WT	Pump motor for Wagon tippler drive-3	1	132	ACB	KW	415	2RX3CX150 Al	A	DM
44	CHP	WT	Wheel choker motor (2x2.2kW)	1	2x2.2	RDOL	KW	415	2RX3CX10 Al	B	DN1
45	CHP	WT	Lubrication panel	1	32	SFU	A	415	4CX25 Al	A	E3
46	CHP	WS-WT	Raw power supply for Weighing System	1	32	SFU	A	240	2CX16 Al	A	E3
47	CHP	ACDB	ACDB1-Incomer-1 at WTC for ZSS,CJD AT WTC & TP-1, Hoist at TP-1	1	63.0	SFU	A	415	3.5CX50 Al	A	E3
48	CHP	ACDB	ACDB1-Incomer-2 at WTC for ZSS,CJD AT WTC & TP-1, Hoist at TP-1	1	63.0	SFU	A	415	3.5CX50 Al	B	E3
49	CHP	AC-WT	Air Conditioning-1 for WT Control Room	1	32	SFU	A	240	2CX35 Al	B	E3
50	CHP	AC-WT	Air Conditioning-2 for WT Control Room	1	32	SFU	A	240	2CX35 Al	A	E3
51	CHP	VS	Supply fan of WT+TP-1+BCN 1AB underground portion ventilation	1	30	DOL	KW	415	3CX16 Al	A	DK21
52	CHP	VS	Exhaust fan of WT+TP-1+BCN 1AB underground portion ventilation	1	7.5	DOL	KW	415	3CX16 Al	B	DK2
53	CHP	C&I-WT	Raw power supply for PLC panel	1	32	SFU	A	240	2CX35 Al	A	E3
54	CHP	C&I-WT	Raw power supply for WT Control Desk	1	32	SFU	A	240	2CX35 Al	A	E3
55	CHP	HTR	Hooter at WT COMPLEX	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
56	CHP	DG	Diverter gate (DG-1)	1	1.1	RDOL	KW	415	3CX2.5 Cu	A	DN1
57	CHP	DG	Diverter gate (DG-2)	1	1.1	RDOL	KW	415	3CX2.5 Cu	A	DN1
58	CHP	DG	Diverter gate (DG-3)	1	1.1	RDOL	KW	415	3CX2.5 Cu	B	DN1
59	CHP	CONV	CONV-1A	1	45	DOL	KW	415	3CX95 Al	A	DK21
60	CHP	CONV	CONV-1B	1	45	DOL	KW	415	3CX95 Al	B	DK21
61	CHP	SP	Sump pump (SP-3&4) AT TP-1	1	100	SFU	A	415	4CX25 Al	B	E3
62	CHP	HTR	Hooter at TP-1	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
63	CHP	VS	Supply fan motor for Conv-2A/2B + TP-1 ventilation	1	37	DOL	KW	415	3CX16 Al	B	DK21
64	CHP	VS	Exhaust fan motor for Conv-2A/2B + TP-1 ventilation	1	15	DOL	KW	415	3CX16 Al	A	DK2
65	CHP	SM	SUSPENDED MAGNET SM-1 AT PH-1 FOR CONV-2A	1	63.0	SFU	A	415	4CX25 Al	A	E3
66	CHP	SM	SUSPENDED MAGNET SM-2 AT PH-1 FOR CONV-2B	1	63.0	SFU	A	415	4CX25 Al	B	E3
67	CHP	HOIST	10 T Electric hoist power supply for dozer shed	1	32	SFU	A	415	4CX10 Al	B	E3
68	CHP	HOIST	Power Supply for 10 T Electric hoist for payload shed	1	32	SFU	A	415	4CX10 Al	A	E3
69	CHP	HOIST	Power Supply for 3T Electric hoist-1 at TP-1 (-)19.2M	1	32	SFU	A	415	4CX10 Al	B	E3
70	CHP	HOIST	Power Supply for 3T Electric hoist-2 at TP-1 (-)19.2M	1	32	SFU	A	415	4CX10 Al	B	E3
71	CHP	VS	Ventilation fan-1 (supply)-CH MCC-2	1	3.7	DOL	KW	240	3CX2.5 Cu	A	DK2
72	CHP	VS	Ventilation fan-2 (supply)-CH MCC-2	1	3.7	DOL	KW	240	3CX2.5 Cu	A	DK2
73	CHP	VS	Ventilation fan-3 (supply)-CH MCC-2	1	3.7	DOL	KW	240	3CX2.5 Cu	B	DK2
74	CHP	VS	Ventilation fan-4 (supply)-CH MCC-2	1	3.7	DOL	KW	240	3CX2.5 Cu	B	DK2
75	CHP	VS	Ventilation fan-1 (Exhaust)-CH MCC-2	1	0.37	DOL	KW	240	3CX2.5 Cu	A	DK2
76	CHP	VS	Ventilation fan-2 (Exhaust)-CH MCC-2	1	0.37	DOL	KW	240	3CX2.5 Cu	A	DK2



Name of the Board: CHP AREA (CHP MCC-1 NEAR WAGON TIRPPLER)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	Cable	SECTION	MODULE TYPE
77	CHP	VS	Ventilation fan-3 (Exhaust)-CH MCC-2	1	0.37	DOL	KW	240	3CX2.5 Cu	B	DK2
78	CHP	VS	Ventilation fan-4 (Exhaust)-CH MCC-2	1	0.37	DOL	KW	240	3CX2.5 Cu	B	DK2
79	CHP	VS	exhaust fan-1-MCC-1 Battery room	1	0.37	DOL	KW	240	3CX2.5 Cu	A	DK2
80	CHP	VS	exhaust fan-2-MCC-1 Battery room	1	0.37	DOL	KW	240	3CX2.5 Cu	B	DK2
81	CHP	FUT	Future Use for BMS	1	32	SFU	A	240	2CX10Al	A	E3
82	CHP	FUT	Future Use for BMS	1	32	SFU	A	240	2CX10Al	A	E3
83	CHP	FUT	Future Use for Hooter	1	6	SFU	A	240	2CX2.5 Cu	A	E3
84	CHP	FUT	Future Use for Hooter	1	6	SFU	A	240	2CX2.5 Cu	A	E3
85	CHP	FUT	Future Use for Pressurised Ventilation	1	5.5	DOL	KW	415	3CX10 Al	B	DK2
86	CHP	RPG	Rack and pinion gate-3	1	7.5	RDOL	KW	415	3CX10 Al	A	DN1
87	CHP	RPG	Rack and pinion gate-4	1	7.5	RDOL	KW	415	3CX10 Al	B	DN1
88	CHP	HTR	Hooter-9 at DH	1	0.55	DOL	KW	415	3CX10 Al	A	DK2
89	CHP	FUT	Future Use forHooter-9 at DH	1	6	SFU	A	240	2CX2.5 Cu	A	E3
90	CHP	BWS	Belt Weigh Scale-1 (TP-1)	1	32	SFU	A	415	4CX25 Al	A	E3
91	CHP	BWS	Belt Weigh Scale-2 (TP-1)	1	32	SFU	A	415	4CX25 Al	B	E3
92	CHP		SPARE	3	6	SFU	A	240	2CX2.5 Cu		E3
93	CHP		SPARE	5	32	SFU	A	240	2CX10Al		E3
94	CHP		SPARE	2	63.0	SFU	A	415	4CX25 Al		E3
95	CHP		SPARE	1	1.1	RDOL	KW	415	3CX2.5 Cu		DN1
96	CHP		SPARE	1	7.5	RDOL	KW	415	3CX10 Al		DN1
97	CHP		SPARE	1	2x2.2	RDOL	KW	415	2RX3CX10 Al		DN1
98	CHP		SPARE	2	250	SFU	A	415	3.5CX150 Al		E3
99	CHP		SPARE	2	100	SFU	A	415	4CX16 Al		E3
100	CHP		SPARE	2	0.37	DOL	KW	240	3CX2.5 Cu		DK2
101	CHP		SPARE	1	0.55	DOL	KW	415	3CX10 Al		DK2
102	CHP		SPARE	2	3.7	DOL	KW	240	3CX2.5 Cu		DK2
103	CHP		SPARE	1	5.5	DOL	KW	415	3CX10 Al		DK2
104	CHP		SPARE	1	7.5	DOL	KW	415	3CX16 Al		DK2
105	CHP		SPARE	1	15	DOL	KW	415	3CX16 Al		DK2
106	CHP		SPARE	1	30	DOL	KW	415	3CX16 Al		DK21
107	CHP		SPARE	1	37	DOL	KW	415	3CX16 Al		DK21
108	CHP		SPARE	1	45	DOL	KW	415	3CX95 Al		DK21
109	CHP		SPARE	1	75	DOL	KW	415	3CX150 Al		DK21
110	CHP		SPARE	1	160	ACB	KW	415	2RX3CX240 Al		DM
111	CHP		SPARE	1	132	ACB	KW	415	2RX3CX150 Al		DM
112	CHP		CONTROL SUPPLY	2	3.0		KVA				CS
113	CHP		BUS PT	2							G1
114	CHP		ACB I/C PANELS		4000/4000A						
115	CHP		ACB O/G PANELS		4000/630A						
116	CHP		MCC DFDO		4000/630A						
117	CHP		ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: CHP AREA (CHP MCC-2 NEAR CRUSHER HOUSE)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY	RATING	TYPE	UNIT	VOLTS	SELECTED CABLE SIZE	SECTION	MODULE TYPE
1	CHP	INCOMER	INCOMER-1	1	2500	ACB	A	415	BUS DUCT	A	DAET I/C
2	CHP	INCOMER	INCOMER-2	1	2500	ACB	A	415	BUS DUCT	B	DAET I/C
3	CHP	INCOMER	INCOMER-3	1	2500	ACB	A	415	BUS DUCT	C	DAET I/C
4	CHP	BUSCOUPLER	BUS COUPLER-1	1	2500	ACB	A	415	NA	NA	DAET B/C
5	CHP	BUSCOUPLER	BUS COUPLER-2	1	2500	ACB	A	415	NA	NA	DAET B/C
6	CHP	BC	220 V DC Battery Charger-1	1	125	SFU	A	415	3.5CX95 Al	A	E3
7	CHP	BC	220V DC Battery Charger-2	1	125	SFU	A	415	3.5CX95 Al	B	E3
8	CHP	BC	24 V DC Battery Charger-1	1	63	SFU	A	415	4CX10 Al	A	E3
9	CHP	BC	24 V DC Battery Charger-2	1	63	SFU	A	415	4CX10 Al	B	E3
10	CHP	UPS	UPS Power Supply-1	1	63	SFU	A	415	4CX16 Al	A	E3
11	CHP	UPS	UPS Power Supply-2	1	63	SFU	A	415	4CX16 Al	A	E3
12	CHP	UPS	Raw power supply for UPS bypass arrangement	1	63	SFU	A	240	2CX16 Al	A	E3
13	CHP	FUT	Future Use	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
14	CHP	AC	Air Conditioning RIO room Power Supply	1	63	SFU	A	415	3.5CX50 Al	B	E3
15	CHP	WDB	Welding DB-1 power supply-1	1	250	MCCB	A	415	3.5CX300 Al	A	E3
16	CHP	WDB	Welding DB-1 power supply-2	1	250	MCCB	A	415	3.5CX300 Al	B	E3
17	CHP	WDB	Welding DB-2 power supply-1	1	250	MCCB	A	415	3.5CX300 Al	A	E3
18	CHP	WDB	Welding DB-2 power supply-2	1	250	MCCB	A	415	3.5CX300 Al	B	E3
19	CHP	ILL	Illumination Power Supply-1 MLDB-1	1	250	MCCB	A	415	3.5CX185 Al	A	E3
20	CHP	ILL	Illumination Power Supply-2 MLDB-1	1	250	MCCB	A	415	3.5CX185 Al	B	E3
21	CHP	ILL	Illumination Power Supply-1 MLDB-2	1	250	MCCB	A	415	3.5CX185 Al	A	E3
22	CHP	ILL	Illumination Power Supply-2 MLDB-2	1	250	MCCB	A	415	3.5CX185 Al	B	E3
23	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-1	1	6	SFU	A	240	2CX2.5 Cu	A	E3
24	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-2	1	6	SFU	A	240	2CX2.5 Cu	B	E3
25	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-3	1	6	SFU	A	240	2CX2.5 Cu	A	E3
26	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-4	1	6	SFU	A	240	2CX2.5 Cu	B	E3
27	CHP	BMS	Belt Monitoring System-1	1	32	SFU	A	415	4CX16 Al	A	E3
28	CHP	AUX	Bus Duct-1 Auxiliary Power Supply	1	16	SFU	A	240	2CX10 Al	A	E3
29	CHP	AUX	Bus Duct-2 Auxiliary Power Supply	1	16	SFU	A	240	2CX10 Al	B	E3
30	CHP	AUX	Bus Duct-3 Auxiliary Power Supply	1	16	SFU	A	240	2CX10 Al	A	E3
31	CHP	AUX	6.6 kV HT Board Auxiliary Power Supply-1	1	32	SFU	A	415	4CX25 Al	A	E3
32	CHP	AUX	6.6 kV HT Board Auxiliary Power Supply-2	1	32	SFU	A	415	4CX25 Al	B	E3
33	CHP	AUX	LT Transformer-1 Auxiliary Supply	1	16	SFU	A	240	2CX10 Al	A	E3
34	CHP	AUX	LT Transformer-2 Auxiliary Supply	1	16	SFU	A	240	2CX10 Al	B	E3
35	CHP	AUX	LT Transformer-3 Auxiliary Supply	1	16	SFU	A	240	2CX10 Al	B	E3
36	CHP	FF	Fire Fighting-1	1	16	SFU	A	240	2CX6 Al	A	E3
37	CHP	FF	Fire Fighting-2	1	16	SFU	A	240	2CX6 Al	B	E3
38	CHP	VS	Ventilation fan-1 (supply)-CH MCC-2	1	3.7	DOL	KW	415	3CX2.5 Cu	B	DK2
39	CHP	VS	Ventilation fan-2 (supply)-CH MCC-2	1	3.7	DOL	KW	415	3CX2.5 Cu	A	DK2
40	CHP	VS	Ventilation fan-3 (supply)-CH MCC-2	1	3.7	DOL	KW	415	3CX2.5 Cu	B	DK2
41	CHP	VS	Ventilation fan-4 (supply)-CH MCC-2	1	3.7	DOL	KW	415	3CX2.5 Cu	A	DK2
42	CHP	VS	Ventilation fan-1 (exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
43	CHP	VS	Ventilation fan-2 (exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
44	CHP	VS	Ventilation fan-3 (exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
45	CHP	VS	Ventilation fan-4 (exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
46	CHP	SCOOP	Scoop coupling power supply for Conv-2A	1	32	SFU	A	415	4CX16 Al	A	E3
47	CHP	SCOOP	Scoop coupling power supply for Conv-2B	1	32	SFU	A	415	4CX16 Al	B	E3
48	CHP	BRK	Brakes-1 for Conv-2A	1	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
49	CHP	BRK	Brakes-2 for Conv-2B	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
50	CHP	FUT	Future Use	1	63	SFU	A	415	4CX10 Al	B	E3
51	CHP	FUT	Future Use	1	63	SFU	A	415	4CX10 Al	B	E3
52	CHP	SM	SUSPENDED MAGNET SM-3 AT PH-2 FOR CONV-9	1	63.0	SFU	A	415	4CX35 Al	A	E3
53	CHP	SM	SUSPENDED MAGNET SM-4 AT PH-3 FOR CONV-10	1	63.0	SFU	A	415	4CX35 Al	B	E3
54	CHP	ILMS	ILMS-1 at level (EL 45 m)	1	63	SFU	A	415	3.5X50 Al	A	E3
55	CHP	ILMS	ILMS-2 at level (EL 45 m)	1	63	SFU	A	415	3.5X50 Al	B	E3
56	CHP	DG	Diverter gate (DG-4)	1	1.1	RDOL	KW	415	3CX25 Al	A	DN1
57	CHP	DG	Diverter gate (DG-5)	1	1.1	RDOL	KW	415	3CX25 Al	B	DN1
58	CHP	VGf	Vibrating grizzly feeder (VGf-1)	1	30	DOL	KW	415	3CX95 Al	A	DK21
59	CHP	VGf	Vibrating grizzly feeder (VGf-2)	1	30	DOL	KW	415	3CX95 Al	A	DK21
60	CHP	VGf	Vibrating grizzly feeder (VGf-3)	1	30	DOL	KW	415	3CX95 Al	B	DK21
61	CHP	VGf	Vibrating grizzly feeder (VGf-4)	1	30	DOL	KW	415	3CX95 Al	B	DK21
62	CHP	CR	Power pack for crusher door opening-1	1	32	SFU	A	415	4CX2.5 Cu	A	E3
63	CHP	CR	Power pack for crusher door opening-2	1	32	SFU	A	415	4CX2.5 Cu	B	E3
64	CHP	CR	Power pack for crusher door opening-3	1	32	SFU	A	415	4CX2.5 Cu	A	E3
65	CHP	CR	Power pack for crusher door opening-4	1	32	SFU	A	415	4CX2.5 Cu	B	E3
66	CHP	SCOOP	Scoop coupling power supply for CR-1	1	32	SFU	A	415	4CX2.5 Cu	A	E3
67	CHP	SCOOP	Scoop coupling power supply for CR-2	1	32	SFU	A	415	4CX2.5 Cu	B	E3
68	CHP	SCOOP	Scoop coupling power supply for CR-3	1	32	SFU	A	415	4CX2.5 Cu	A	E3
69	CHP	SCOOP	Scoop coupling power supply for CR-4	1	32	SFU	A	415	4CX2.5 Cu	B	E3
70	CHP	BFD	Belt feeders (BFD-1)	1	22	DOL	KW	415	3CX35 Al	A	DK2
71	CHP	BFD	Reversible Belt feeders (BFD-2)	1	22	RDOL	KW	415	3CX35 Al	B	DN1
72	CHP	BFD	Belt feeders (BFD-3)	1	22	DOL	KW	415	3CX35 Al	B	DK2
73	CHP	BFD	Reversible Belt feeders (BFD-4)	1	22	RDOL	KW	415	3CX35 Al	A	DN1
74	CHP	FG	Flap gates (FG-1)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
75	CHP	FG	Flap gates (FG-2)	1	3.7	RDOL	KW	415	3CX2.5 Cu	B	DN1
76	CHP	FG	Flap gates (FG-3)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
77	CHP	FG	Flap gates (FG-4)	1	3.7	RDOL	KW	415	3CX2.5 Cu	B	DN1
78	CHP	FG	Flap gates (FG-5)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
79	CHP	FG	Flap gates (FG-6)	1	3.7	RDOL	KW	415	3CX2.5 Cu	B	DN1
80	CHP	CONV	CONV-5A	1	75	DOL	KW	415	3CX150 Al	A	DK21
81	CHP	CONV	CONV-5B	1	75	DOL	KW	415	3CX150 Al	B	DK21
82	CHP	CSU	CSU POWER SUPPLY (AT CRUSHER HOUSE)	1	100	MCCB	A	415	4CX35 Al	B	E3



Name of the Board: CHP AREA (CHP MCC-2 NEAR CRUSHER HOUSE)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY	RATING	TYPE	UNIT	VOLTS	SELECTED CABLE SIZE	SECTION	MODULE TYPE
83	CHP	FUT	Future Use	1	63	SFU	A	415	4CX16 AI	A	E3
84	CHP	FUT	Future Use	1	63	SFU	A	415	4CX16 AI	B	E3
85	CHP	ACDB	ACDB6A-CH-1-incomer-1 (EL 10.94)	1	125	MCCB	A	415	3.5CX95 AI	A	E3
86	CHP	ACDB	ACDB6A-CH-1-incomer-2 (EL 10.94)	1	125	MCCB	A	415	3.5CX95 AI	B	E3
87	CHP	ACDB	ACDB6B-CH-1-incomer-1 (EL 10.94)	1	100	MCCB	A	415	3.5CX95 AI	A	E3
88	CHP	ACDB	ACDB6B-CH-1-incomer-2 (EL 10.94)	1	100	MCCB	A	415	3.5CX95 AI	B	E3
89	CHP	ACDB	ACDB7-CH-2-incomer-1 (EL 22.04)	1	63	SFU	A	415	3.5CX95 AI	A	E3
90	CHP	ACDB	ACDB7-CH-2-incomer-2 (EL 22.04)	1	63	SFU	A	415	3.5CX95 AI	B	E3
91	CHP	ELVT	Elevator for crusher house	1	63	SFU	A	415	4CX25 AI	B	E3
92	CHP	DE	DE System Centrifugan fan-1 at crusher house	1	132	ACB	KW	415	2RX3CX300 AI	A	DM
93	CHP	DE	DE System Centrifugan fan-2 at crusher house	1	132	ACB	KW	415	2RX3CX300 AI	B	DM
94	CHP	FUT	Future Use	1	32	SFU	A	415	4CX16 AI	A	E3
95	CHP	HTR	Hooter-4 at CH	1	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
96	CHP	CONV	CONV-3A	1	132	ACB	KW	415	2RX3CX150 AI	A	DM
97	CHP	CONV	CONV-3B	1	132	ACB	KW	415	2RX3CX150 AI	B	DM
98	CHP	BRK	Brakes for CONV-4A (DH)	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
99	CHP	FG	Flap gates (FG-7)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
100	CHP	FG	Flap gates (FG-8)	1	3.7	RDOL	KW	415	3CX2.5 Cu	B	DN1
101	CHP	FG	Flap gates (FG-9)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
102	CHP	CONV	CONV-9	1	132	ACB	KW	415	2RX3CX150 AI	A	DM
103	CHP	CONV	CONV-10	1	132	ACB	KW	415	2RX3CX150 AI	B	DM
104	CHP	FUT	Future Use	1	32	SFU	A	415	4CX10 AI	B	E3
105	CHP	ACDB	ACDB2A-TP2-incomer-1 LEVEL	1	63	SFU	A	415	3.5CX95 AI	A	E3
106	CHP	ACDB	ACDB2A-TP2-incomer-2 LEVEL	1	63	SFU	A	415	3.5CX95 AI	B	E3
107	CHP	ACDB	ACDB2B-TP2-incomer-1 LEVEL	1	63	SFU	A	415	3.5CX95 AI	A	E3
108	CHP	ACDB	ACDB2B-TP2-incomer-2 LEVEL	1	63	SFU	A	415	3.5CX95 AI	B	E3
109	CHP	HTR	Hooter-3 at TP-2	1	0.55	DOL	KW	415	3CX10 AI	B	DK2
110	CHP	CONV	CONV-4B (EXISTING CH)	1	90	ACB	KW	415	3CX150 AI	B	DM
111	CHP	RPG	Rack and pinion gate-1	1	5.5	RDOL	KW	415	3CX10 AI	A	DN1
112	CHP	RPG	Rack and pinion gate-2	1	5.5	RDOL	KW	415	3CX10 AI	B	DN1
113	CHP	VF	Vibro feeders (VF-1)	1	2.2	DOL	KW	415	3CX25 AI	A	DK2
114	CHP	VF	Vibro feeders (VF-2)	1	2.2	DOL	KW	415	3CX25 AI	B	DK2
115	CHP	VS	Supply fan for tunnel ventilation of ERH-1 and conv-9	1	5.5	DOL	KW	415	3CX25 AI	A	DK2
116	CHP	VS	Exhaust fan for tunnel ventilation of ERH-1 and conv-9	1	5.5	DOL	KW	415	3CX25 AI	B	DK2
117	CHP	SP	Sump pump (SP-5&6) at ERH-1	1	100	SFU	A	415	3.5CX50 AI	B	E3
118	CHP	RPG	Rack and pinion gate-3	1	5.5	RDOL	KW	415	3CX10 AI	A	DN1
119	CHP	RPG	Rack and pinion gate-4	1	5.5	RDOL	KW	415	3CX10 AI	B	DN1
120	CHP	VF	Vibro feeders (VF-3)	1	2.2	DOL	KW	415	3CX25 AI	A	DK2
121	CHP	VF	Vibro feeders (VF-4)	1	2.2	DOL	KW	415	3CX25 AI	B	DK2
122	CHP	VS	Supply fan for tunnel ventilation of ERH-2 and conv-10	1	11	DOL	KW	415	3CX50 AI	A	DK2
123	CHP	VS	Exhaust fan for tunnel ventilation of ERH-2 and conv-10	1	11	DOL	KW	415	3CX50 AI	B	DK2
124	CHP	SP	Sump pump (SP-7 & 8) at ERH-2	1	100	SFU	A	415	3.5CX50 AI	B	E3
125	CHP	BRK	Brakes for Conv-6A	1	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
126	CHP	BRK	Brakes for Conv-6B	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
127	CHP	CONV	CONV-6C	1	55	DOL	KW	415	3CX150 AI	B	DK21
128	CHP	SCOOP	Scoop coupling for Conv-6A	1	32	SFU	A	415	4CX25 AI	A	E3
129	CHP	SCOOP	Scoop coupling for Conv-6B	1	32	SFU	A	415	4CX25 AI	B	E3
130	CHP	FUT	Future use	1	1.1	RDOL	KW	415	3CX25 AI	A	DN1
131	CHP	CSU	CSU power supply (AT TP-3)	1	63	SFU	A	415	3.5X50 AI	B	E3
132	CHP	HTR	Hooter-5 at TP-3	1	0.55	DOL	KW	415	3CX10 AI	A	DK2
133	CHP	ACDB	ACDB3-TP-3-incomer-1 AT LEVEL	1	63	SFU	A	415	3.5CX185 AI	B	E3
134	CHP	ACDB	ACDB3-TP-3-incomer-2 AT LEVEL	1	63	SFU	A	415	3.5CX185 AI	A	E3
135	CHP	DS	Auxiliary Power Supply for DS LCP	1	32	SFU	A	415	2RX3.5CX50 AI	A	E3
136	CHP	BRK	Brakes for Conv-7A	1	0.55	DOL	KW	415	3CX10 AI	A	DK2
137	CHP	BRK	Brakes for Conv-7B	1	0.55	DOL	KW	415	3CX10 AI	B	DK2
138	CHP	SCOOP	Scoop coupling for Conv-7A	1	32	SFU	A	415	3.5CX50 AI	A	E3
139	CHP	SCOOP	Scoop coupling for Conv-7B	1	32	SFU	A	415	3.5CX50 AI	B	E3
140	CHP	BRK	Brakes- CONV-8A	1	0.55	DOL	KW	415	3CX10 AI	A	DK2
141	CHP	BRK	Brakes- CONV-8B	1	0.55	DOL	KW	415	3CX10 AI	B	DK2
142	CHP	SCOOP	Scoop coupling for Conv-8A	1	32	SFU	A	415	3.5CX95 AI	A	E3
143	CHP	SCOOP	Scoop coupling for Conv-8B	1	32	SFU	A	415	3.5CX95 AI	B	E3
144	CHP	DS	Coal settling pond pump drive-1	1	37	DOL	KW	415	3CX70 AI	B	DK21
145	CHP	BMS	Belt Monitoring System-2	1	32	SFU	A	415	4CX16 AI	B	E3
146	CHP	CONV	CONV-4A (TP-2 & DH) (Dual RDOL Drive)	2	110	ACB	KW	415	2RX3CX150 AI	A	DM
147	CHP	DS	DS Compressor Motor-1	1	110	ACB	KW	415	3CX240 AI	A	DM
148	CHP	DS	DS Compressor Motor-2	1	110	ACB	KW	415	3CX240 AI	B	DM
149	CHP	DS	Auxiliary Power supply for Compressor Panel-1	1	32	SFU	A	415	4CX16 AI	A	E3
150	CHP	DS	Auxiliary Power supply for Compressor Panel-2	1	32	SFU	A	415	4CX16 AI	B	E3
151	CHP	bfd	Reversible Belt feeders (Existing CH)	1	22	RDOL	KW	415	3CX35 AI	A	DN1
152	CHP	HTR	Hooter at PH-2	1	0.55	DOL	KW	415	3CX10 AI	B	DK2
153	CHP	HTR	Hooter at PH-3	1	0.55	DOL	KW	415	3CX10 AI	A	DK2
154	CHP	DS	Stockyard Pile Water Dust Suppression Motor-1A	1	90	ACB	KW	415	3CX185 AI	A	DM
155	CHP	DS	Stockyard Pile Water Dust Suppression Motor-1B	1	90	ACB	KW	415	3CX185 AI	B	DM
156	CHP	BRK	Brakes- CONV-4A (TP-2)	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
157	CHP	VS	Ventilation fan-1 (exhaust)-220V DC Battery room	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
158	CHP	VS	Ventilation fan-1 (exhaust)-24V DC Battery room	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
159	CHP	VS	Ventilation fan-1 (supply)-Battery Charger room	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
160	CHP	VS	Ventilation fan-1 (supply)-Battery Charger room	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
161	CHP	DE	Auxiliary Power supply for DE LCP	1	32	SFU	A	415	4CX16 AI	A	E3
162	CHP	DS	DS Local Control Panel at DSPH	1	630	SFU	A	415	4RX1CX400 AI	A	E3
163	CHP	DE	Auxiliary Power supply for DE LCP	1	32	SFU	A	415	4CX16 AI	B	E3
164	CHP	DE	DE-SYSTEM-1 LCP (Compressor + RAF Motor)	1	100	SFU	A	415	3.5CX185 AI	A	E3
165	CHP	DE	DE-SYSTEM-2 LCP (Compressor + RAF Motor)	1	100	SFU	A	415	3.5CX185 AI	B	E3



Name of the Board: CHP AREA (CHP MCC-2 NEAR CRUSHER HOUSE)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY	RATING	TYPE	UNIT	VOLTS	SELECTED CABLE SIZE	SECTION	MODULE TYPE
166	CHP	FUT	Future Use for BMS	1	32	SFU	A	240	2CX10AI	A	E3
167	CHP	FUT	Future Use for BMS	1	32	SFU	A	240	2CX10AI	A	E3
168	CHP	FG	Flap gates (FG-3A)	1	3.7	RDOL	KW	415	3CX25 AI	A	DN1
169	CHP	FG	Flap gates (FG-3B)	1	3.7	RDOL	KW	415	3CX25 AI	B	DN1
170	CHP	FG	Flap gates (FG-3C)	1	3.7	RDOL	KW	415	3CX25 AI	A	DN1
171	CHP	FG	Flap gates (FG-3D)	1	3.7	RDOL	KW	415	3CX25 AI	B	DN1
172	CHP	FG	Flap gates (FG-6A)	1	3.7	RDOL	KW	415	3CX25 AI	A	DN1
173	CHP	FUT	Future Use for Hooter-4 at CH	1	6	SFU	A	240	2CX2.5 Cu	A	E3
174	CHP	FUT	Future Use for Hooter-3 at TP-2	1	6	SFU	A	240	2CX2.5 Cu	B	E3
175	CHP	FUT	Future Use for Hooter-9 at DH	1	6	SFU	A	240	2CX2.5 Cu	A	E3
176	CHP	FUT	Future Use for Hooter-5 at TP-3	1	6	SFU	A	240	2CX2.5 Cu	B	E3
177	CHP	FUT	Future Use for Hooter at PH-2	1	6	SFU	A	240	2CX2.5 Cu	A	E3
178	CHP	FUT	Future Use for Hooter at PH-3	1	6	SFU	A	240	2CX2.5 Cu	B	E3
179	CHP	FUT	Future Use for Pressurised Ventilation	1	5.5	DOL	KW	415	3CX25 AI	A	DK2
180	CHP	BWS	Belt Weigh Scale-3 (PH-2)	1	32	SFU	A	415	4CX25 AI	A	E3
181	CHP	BWS	Belt Weigh Scale-4 (PH-3)	1	32	SFU	A	415	4CX25 AI	B	E3
182	CHP	BWS	Belt Weigh Scale-7 (CH)	1	32	SFU	A	415	4CX25 AI	A	E3
183	CHP	BWS	Belt Weigh Scale-8 (CH)	1	32	SFU	A	415	4CX25 AI	B	E3
184	CHP	DS	Coal settling pond pump drive-2	1	37	DOL	KW	415	3CX70 AI	A	DK21
185	CHP		SPARE	5	16	SFU	A	240	2CX2.5 Cu	B	E3
186	CHP		SPARE	6	32	SFU	A	240	2CX10AI	A	E3
187	CHP		SPARE	4	63	SFU	A	415	3.5CX185 AI	A	E3
188	CHP		SPARE	1	125	SFU	A	415	3.5CX95 AI	B	E3
189	CHP		SPARE	1	1.1	RDOL	KW	415	3CX25 AI	A	DN1
190	CHP		SPARE	3	3.7	RDOL	KW	415	3CX25 AI	A	DN1
191	CHP		SPARE	2	5.5	RDOL	KW	415	3CX10 AI	B	DN1
192	CHP		SPARE	1	22	RDOL	KW	415	3CX35 AI	A	DN1
193	CHP		SPARE	2	100	SFU	A	415	3.5CX185 AI	B	E3
194	CHP		SPARE	1	125	SFU	A	415	3.5CX95 AI	B	E3
195	CHP		SPARE	2	250	SFU	A	415	3.5CX185 AI	B	E3
196	CHP		SPARE	1	630	SFU	A	415	4RX1CX400 AI	A	E3
197	CHP		SPARE	4	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
198	CHP		SPARE	4	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
199	CHP		SPARE	2	3.7	DOL	KW	415	3CX2.5 Cu	A	DK2
200	CHP		SPARE	1	5.5	DOL	KW	415	3CX25 AI	A	DK2
201	CHP		SPARE	1	11	DOL	KW	415	3CX50 AI	B	DK2
202	CHP		SPARE	1	22	DOL	KW	415	3CX35 AI	B	DK2
203	CHP		SPARE	2	30	DOL	KW	415	3CX50 AI	B	DK21
204	CHP		SPARE	1	55	DOL	KW	415	3CX150 AI	B	DK21
205	CHP		SPARE	1	75	DOL	KW	415	3CX150 AI	B	DK21
206	CHP		SPARE	1	90	ACB	KW	415	3CX185 AI	B	DM
207	CHP		SPARE	1	110	ACB	KW	415	3CX240 AI	B	DM
208	CHP		SPARE	2	132	ACB	KW	415	2RX3CX150 AI	B	DM
209	CHP		CONTROL SUPPLY	2	3.0		KVA				CS
210	CHP		BUS PT	3							G1
211	CHP		ACB I/C PANELS		2500/2500A						
212	CHP		ACB O/G PANELS		2500/630A						
213	CHP		MCC DFDO		2500/630A						
214	CHP		ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: CHP AREA (CHP MCC-3 NEAR TP-5)											
TYPE OF CONNECTION: TOP/SIDE BUSDUCT ENTRY											
DOUBLE FRONT D/O TYPE											
FLOOR MOUNTED											
S.NO.	SYSTEM	IDENTIFIER	DESCRIPTION	TOTAL QTY (NOS.)	RATING	TYPE	UNIT	VOLTS	SELECTED CABLE SIZE	SECTION	MODULE TYPE
1	CHP	INCOMER	INCOMER-1	1	1600	ACB	A	415	BUS DUCT	A	DAET-I/C
2	CHP	INCOMER	INCOMER-2	1	1600	ACB	A	415	BUS DUCT	B	DAET-I/C
3	CHP	BUSCOUPLER	BUS COUPLER	1	1600	ACB	A	415	NA	NA	DAET-B/C
4	CHP	UPS	UPS Power Supply-1	1	32	SFU	A	415	4CX16 Al	A	E3
5	CHP	UPS	UPS Power Supply-2	1	32	SFU	A	415	4CX16 Al	B	E3
6	CHP	UPS	Raw power supply for UPS bypass arrangement	1	32	SFU	A	240	2CX16 Al	A	E3
7	CHP	ILL	Illumination Power Supply-1	1	250	SFU	A	415	3.5CX185 Al	A	E3
8	CHP	ILL	Illumination Power Supply-2	1	250	SFU	A	415	3.5CX185 Al	B	E3
9	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-1	1	6	SFU	A	240	2CX2.5 Cu	A	E3
10	CHP	AUX	Auxiliary Power Supply for Lighting Transformer-2	1	6	SFU	A	240	2CX2.5 Cu	B	E3
11	CHP	WDB	Welding DB power supply-1	1	250	SFU	A	415	3.5CX300 Al	A	E3
12	CHP	WDB	Welding DB power supply-2	1	250	SFU	A	415	3.5CX300 Al	B	E3
13	CHP	FUT	Future Use	1	32	SFU	A	415	4CX16 Al	A	E3
14	CHP	AC	Air Conditioning RIO room Power Supply	1	32	SFU	A	415	4CX16 Al	B	E3
15	CHP	AUX	Bus Duct-1 Auxiliary Power Supply	1	16	SFU	A	240	2CX6 Al	A	E3
16	CHP	AUX	Bus Duct-2 Auxiliary Power Supply	1	16	SFU	A	240	2CX6 Al	B	E3
17	CHP	AUX	LT Transformer-1 Auxiliary Supply	1	16	SFU	A	240	2CX6 Al	A	E3
18	CHP	AUX	LT Transformer-2 Auxiliary Supply	1	16	SFU	A	240	2CX6 Al	B	E3
19	CHP	FUT	Future Use	1	32	SFU	A	415	4CX16 Al	A	E3
20	CHP	ACDB	ACDB4-TP4-incomer-1 (EL - 29.2)	1	125	SFU	A	415	3.5CX95 Al	A	E3
21	CHP	ACDB	ACDB4-TP4-incomer-2 (EL - 29.2)	1	125	SFU	A	415	3.5CX95 Al	B	E3
22	CHP	FUT	Future Use	1	32	SFU	A	415	4CX16 Al	A	E3
23	CHP	FUT	Future Use	1	32	SFU	A	415	4CX16 Al	B	E3
24	CHP	HTR	Hooter-6 at TP-4	1	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
25	CHP	ILMS	ILMS-3 at TP-5	1	63	SFU	A	415	4CX10 Al	A	E3
26	CHP	ILMS	ILMS-4 at TP-5	1	63	SFU	A	415	4CX10 Al	B	E3
27	CHP	DG	Diverter gates (DG-6)	1	1.1	RDOL	KW	415	3CX10 Al	A	DN1
28	CHP	DG	Diverter gates (DG-7)	1	1.1	RDOL	KW	415	3CX10 Al	B	DN1
29	CHP	ACDB	ACDB5-TP5-incomer-1 (EL - 53.1)	1	63	SFU	A	415	3.5CX50 Al	A	E3
30	CHP	ACDB	ACDB5-TP5-incomer-2 (EL - 53.1)	1	63	SFU	A	415	3.5CX50 Al	B	E3
31	CHP	HTR	Hooter-7 at TP-5	1	0.55	DOL	KW	415	3CX2.5 Cu	B	DK2
32	CHP	FG	Flap gates (FG-10)	1	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
33	CHP	FG	Flap gates (FG-11)	1	3.7	RDOL	KW	415	3CX2.5 Cu	B	DN1
34	CHP	CONV	CONV-8C	1	75	DOL	KW	415	3CX150 Al	A	DK21
35	CHP	CONV	CONV-8D	1	75	DOL	KW	415	3CX150 Al	B	DK21
36	CHP	HTR	Hooter-8 at Bunker Floor	1	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
37	CHP	TT	Traveling trippers-1	1	100	SFU	A	415	4CX50 Al	A	E3
38	CHP	TT	Traveling trippers -2	1	100	SFU	A	415	4CX50 Al	B	E3
39	CHP	FUT	Future Use	1	32	SFU	A	415	4CX10 Al	A	E3
40	CHP	VS	Bunker bay exhaust fan PANEL (FOR 6 FANS)	1	100	SFU	A	415	3.5CX50 Al	B	E3
41	CHP	FUT	Future Use	1	63	SFU	A	415	4CX10 Al	B	E3
42	CHP	FUT	Future Use	1	63	SFU	A	415	4CX10 Al	A	E3
43	CHP	VS	Ventilation fan-1 (supply)-MCC-3	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
44	CHP	VS	Ventilation fan-2 (supply)-MCC-3	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
45	CHP	VS	Ventilation fan-3 (supply)-MCC-3	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
46	CHP	VS	Ventilation fan-4 (supply)-MCC-3	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
47	CHP	VS	Ventilation fan-1 (Exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
48	CHP	VS	Ventilation fan-2 (Exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
49	CHP	VS	Ventilation fan-3 (Exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
50	CHP	VS	Ventilation fan-4 (Exhaust)-CH MCC-2	1	2.2	DOL	KW	415	3CX2.5 Cu	B	DK2
51	CHP	VS	Ventilation fan-1 (Exhaust)-24V DC Battery room	1	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
52	CHP	FG	Flap gates (FG-12)	1	3.7	RDOL	KW	415	3CX25 Al	A	DN1
53	CHP	FG	Flap gates (FG-13)	1	3.7	RDOL	KW	415	3CX25 Al	B	DN1
54	CHP	FUT	Future Use for Hooter-6 at TP-4	1	6	SFU	A	240	2CX2.5 Cu	A	E3
55	CHP	FUT	Future Use for Hooter-7 at TP-5	1	6	SFU	A	240	2CX2.5 Cu	B	E3
56	CHP	FUT	Future Use for Hooter-8 at Bunker Floor	1	6	SFU	A	240	2CX2.5 Cu	A	E3
57	CHP	FUT	Future Use for Pressurised Ventilation	1	5.5	DOL	KW	415	3CX10 Al	B	DK2
58	CHP	BWS	Belt Weigh Scale-5 (TP-4)	1	32	SFU	A	415	4CX25 Al	A	E3
59	CHP	BWS	Belt Weigh Scale-6 (TP-4)	1	32	SFU	A	415	4CX25 Al	B	E3
60	CHP		SPARE	3	6	SFU	A	240	2CX2.5 Cu	A	E3
61	CHP		SPARE	3	32	SFU	A	415	4CX10 Al	A	E3
62	CHP		SPARE	2	63	SFU	A	415	4CX10 Al	A	E3
63	CHP		SPARE	1	1.1	RDOL	KW	415	3CX10 Al	B	DN1
64	CHP		SPARE	2	3.7	RDOL	KW	415	3CX2.5 Cu	A	DN1
65	CHP		SPARE	1	100	SFU	A	415	3.5CX50 Al	B	E3
66	CHP		SPARE	1	125	SFU	A	415	3.5CX95 Al	B	E3
67	CHP		SPARE	1	250	SFU	A	415	3.5CX185 Al	A	E3
68	CHP		SPARE	2	0.55	DOL	KW	415	3CX2.5 Cu	A	DK2
69	CHP		SPARE	3	2.2	DOL	KW	415	3CX2.5 Cu	A	DK2
70	CHP		SPARE	1	5.5	DOL	KW	415	3CX10 Al	B	DK2
71	CHP		SPARE	1	75	DOL	KW	415	3CX150 Al	B	DK21
72	CHP		CONTROL SUPPLY	2	3.0		CS	KVA			CS
73	CHP		BUS PT	2			G1				G1
74	CHP		ACB I/C PANELS		1600/1600A						
75	CHP		ACB O/G PANELS		1600/630A						
76	CHP		MCC DFDO		1600/630A						
			ETHERNET SWITCH	2							

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



Name of the Board: EPDB						
TYPE OF CONNECTION: CABLE ENTRY						
SINGLE FRONT FIXED COMPARTMENTAL TYPE						
FLOOR MOUNTED						
SL.NO	DESCRIPTION	MODULE TYPE	RATING	UNIT	QTY	CABLE SIZE
1	INCOMER	E3(I/C)	100	A	1	
2	OUTGOING					
2.1	220V Battery Charger-1	E3	63	A	1	3.5Cx35
2.2	220V Battery Charger-2	E3	63	A	1	3.5Cx35
2.3	ELDB	E3	63	A	1	3.5Cx35
2.4	Spare	E3	63	A	1	3.5Cx35
2.5	Spare	E3	32	A	1	3.5Cx35
3	BUS PT	VM	50	VA	1	

Name of the Board: ELDB						
TYPE OF CONNECTION: CABLE ENTRY						
SINGLE FRONT FIXED COMPARTMENTAL TYPE						
FLOOR MOUNTED						
SL.NO	DESCRIPTION	MODULE TYPE	RATING	UNIT	QTY	CABLE SIZE
1	INCOMER WITH 25KVA, 415/433 3PH, DELTA / STAR WITH OFF CRICUIT WITH TAP LINK IN STEPS OF $\pm 2.5\%$ & $\pm 5\%$, INSULATION : CLASS F, RESIN IMPEGRATED	EM3	100	A	1	
2	OUTGOING					
2.1	Outdoor ELP-1	E3	32	A	1	3.5Cx70
2.2	Outdoor ELP-2	E3	32	A	1	3.5Cx70
2.3	Indoor ELP-1	E3	32	A	1	3.5Cx35
2.4	N/W Panel Firewall/Network Panel	E1	32	A	3	2CX16
2.5	Operator work Station PC Work Station	E1	32	A	3	2CX16
2.6	EWS&DFR	E1	32	A	2	2CX16
2.7	MWS	E1	32	A	1	2CX16
2.8	RTK Relay test system,type multi-Amp PULSAR/Omicron/Eq.	E1	32	A	1	2CX16
2.9	LVS Large Video Screen	E1	32	A	1	2CX16
2.10	Operator Desk Operator Desk (1+1)	E1	32	A	2	2CX16
2.11	Server Main & Redundant Server	E1	32	A	2	2CX16
2.12	GPS Time Syn.Equipment	E1	32	A	1	2CX16
2.13	Gateway For RLDC/DCS #	E1	32	A	4	2CX16
2.14	Spare	E3	32	A	1	3.5Cx70
2.15	Spare	E3	32	A	1	3.5Cx35
2.16	Spare	E1	32	A	3	2CX16
3	BUS PT	VM	50	VA	1	

Name of the Board: MLDB						
TYPE OF CONNECTION: CABLE ENTRY						
SINGLE FRONT FIXED COMPARTMENTAL TYPE						
FLOOR MOUNTED						
SL.NO	DESCRIPTION	MODULE TYPE	RATING	UNIT	QTY	CABLE SIZE
1	INCOMER WITH 25KVA, 415/433 3PH, DELTA / STAR WITH OFF CRICUIT WITH TAP LINK IN STEPS OF $\pm 2.5\%$ & $\pm 5\%$, INSULATION : CLASS F, RESIN IMPEGRATED	EM3(I/C)	150	A	2	
2	OUTGOING					
2.1	Outdoor NLP	E3	63	A	2	3.5Cx70
2.2	Outdoor NLP	E3	63	A	2	3.5Cx70
2.3	Outdoor NLP	E3	63	A	2	3.5Cx70
2.4	Outdoor NLP	E3	63	A	2	3.5Cx70
2.5	Indoor NLP	E3	32	A	2	3.5Cx70
2.6	N/W Panel Firewall/Network Panel	E1	32	A	6	2CX16
2.7	Operator work Station PC Work Station	E1	32	A	6	2CX16
2.8	EWS EWS&DFR	E1	32	A	4	2CX16
2.9	MWS	E1	32	A	2	2CX16
2.10	RTK Relay test system,type multi-Amp PULSAR/Omicron/Eq.	E1	32	A	2	2CX16
2.11	LVS Large Video Screen	E1	32	A	2	2CX16
2.12	Operator Desk Operator Desk (1+1)	E1	32	A	4	2CX16
2.13	Server Main & Redundant Server	E1	32	A	4	2CX16
2.14	GPS Time Syn.Equipment	E1	32	A	2	2CX16
2.15	Gateway For RLDC/DCS	E1	32	A	8	2CX16
2.16	SPARE	E3	32	A	2	3.5Cx70
2.17	SPARE	E3	63	A	4	3.5Cx70
2.18	SPARE	E1	32	A	8	2CX16
3	BUSCOUPLER	EM3(B/C)	150	A	1	
4	BUS PT	VM	50	VA	2	

Notes:

All cable glands and lugs of suitable size for cable termination at MCC end shall be supplied by vendor.



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-C)**

SPECIFICATION NO. EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 28.05.2018

SHEET : 1 OF 1

ANNEXURE-C

MODULE WISE BILL OF MATERIAL



SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.
1	DAET (I/C)	PMCC INCOMER OF 1600A, 2500A, 3000A, 3200A, 4000A SHALL COMPRISE OF:	
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC,4NO + 4NC CONTACTS OF POSITION/ CELL SWITCH. SPRING CHARGE LIMIT SWITCH WITH minimum 2NO + 2NC contacts.	1
		CONTROL FUSE 6A	15
		CONTROL FUSE 16A	4
		FUSE BASE 32A	19
		Indicating Lamp	5
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3
		CURRENT TRANSFORMER (PROTECTION) with VDR 10VA,CL-PS	3
		POTENTIAL TRANSFORMER -CAST RESIN, OVER VOLTAGE FACTOR 1.2 CONT./1.5 FOR 30 SEC . 415/110,50 VA CL-0.5 INSL CL-E	3
		BREAKER CONTACT MULTIPLICATION RELAY TYPE VAJC 11 OR EQVT	1
		NEUTRAL LINK 32A	1
		CONTROL TERMINALS(FIXED)	As required
		CT SHORTING TERMINAL-STUD TYPE	As required
		POWER TERMINAL	As required
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	2
		AUXILIARY CONTACTOR 2NO+2NC,220V DC	1
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS:	1
		• SHORT CIRCUIT PROTECTION (51)	
		• EARTH FAULT PROTECTION (51N)	
		• OVER LOAD PROTERCTION	
		• RESTRICTED EARTH FAULT PROTECTION(64R)	
		• RESIDUAL EARTH FAULT PROTECTION(64)	
		• TRIP CIRCUIT SUPERVISION (95)	
		• CIRCUIT BREAKER MONITORING	
		• PT FUSE FAILURE	
		• ENERGY METERING	
		• CURRENT, VOLTAGE & FREQUENCY MEASUREMENT	
		• SYNCHRONIZING FEATURE	
		• No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET	
		• ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	
		CURRENT TRANSFORMER (METERING) with 10VA,CL-1.0	3
		VOLTMETER (AC),96 X 96 mm2, SCALE-90, CL-2.0,0-500V DIRECT	1
		BREAKER CONTROL SWITCH (TNC SWITCH)	1
		TRIP SELECTOR SWITCH	1
		SYNC SELECTOR SWITCH	1
		ANALOG AMMETER	1
		AMMETER SELECTOR SWITCH	1
		VOLTMETER SELECTOR SWITCH	1
		HAND REST TYPE LOCKOUT RELAY(86)	1
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2
2	DAET/DAE (B/C)	PMCC/MCC BUSCOUPLER OF 400A, 630A, 800A, 1000A, 1250A, 1600A, 2500A, 3000A, 3200A,4000A SHALL COMPRISE OF:	
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC	1
		CONTROL FUSE 6A	9
		CONTROL FUSE 16A	6
		FUSE BASE 32A	15
		AUXILIARY CONTACTOR 2NO+2NC 220VDC	6
		BREAKER CONTACT MULTIPLICATION RELAY TYPE VAJC 11 OR EQVT	1
		Indicating Lamp	5
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3
		CURRENT TRANSFORMER (METERING) with 10VA,CL-1.0	3
		ANALOG AMMETER	1
		NEUTRAL LINK 32A	1
		CONTROL TERMINALS(FIXED)	As required
		CT SHORTING TERMINAL-STUD TYPE	As required
		POWER TERMINAL	As required
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	5
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS:	1
		• SHORT CIRCUIT PROTECTION (51)	
		• EARTH FAULT PROTECTION (51N)	
		• OVER LOAD PROTERCTION	
		• RESIDUAL EARTH FAULT PROTECTION	
		• TRIP CIRCUIT SUPERVISION (95)	
		• CIRCUIT BREAKER MONITORING	
		• PT FUSE FAILURE	
		• ENERGY METERING	
		• CURRENT, VOLTAGE & FREQUENCY MEASUREMENT	
		• SYNCHRONIZING FEATURE	
		• No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET	
		• ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	
		BREAKER CONTROL SWITCH (TNC SWITCH)	1
		HAND REST TYPE LOCKOUT RELAY(86)	1
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2
		DC SOURCE SLECTION SWITCH	2
		RECTIFIER UNIT	1
		2P 32A DC MCB	4



SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.
3	DAE/DAE-TIE (O/G)	OUTGOING BREAKER FEEDER OF 630A, 800A, 1000A, 1250A, 1600A, 2500A SHALL COMPRISE OF:	
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC,4NO + 4NC CONTACTS OF POSITION/ CELL SWITCH. SPRING CHARGE LIMIT SWITCH WITH minimum 2NO + 2NC contacts.	1
		CONTROL FUSE 6A	8
		CONTROL FUSE 16A	2
		FUSE BASE 32A	10
		Indicating Lamp	2
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3
		NEUTRAL LINK 32A	1
		CONTROL TERMINALS(FIXED)	As required
		CT SHORTING TERMINAL-STUD TYPE	As required
		POWER TERMINAL	As required
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS:	1
		• SHORT CIRCUIT PROTECTION (51I)	
		• EARTH FAULT PROTECTION (51N)	
		• OVER LOAD PROTECTION	
		• RESIDUAL EARTH FAULT PROTECTION	
		• TRIP CIRCUIT SUPERVISION (95)	
		• CIRCUIT BREAKER MONITORING	
4	DM /PM	• PT FUSE FAILURE	
		• ENERGY METERING	
		• CURRENT, VOLTAGE & FREQUENCY MEASUREMENT	
		• SYNCHRONIZING FEATURE	
		• No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET	
		• ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	
		BREAKER CONTROL SWITCH (TNC SWITCH)	1
		BREAKER CONTACT MULTIPLICATION RELAY TYPE VAJC 11 OR EQVT	1
		HAND REST TYPE LOCKOUT RELAY(86)	1
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2
		BREAKER CONTROLLED MOTOR ABOVE 90KW & ABOVE SHALL COMPRISE OF:	
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC,4NO + 4NC CONTACTS OF POSITION/ CELL SWITCH. SPRING CHARGE LIMIT SWITCH WITH minimum 2NO + 2NC contacts.	1
		CONTROL FUSE 6A	9
		CONTROL FUSE 16A	2
		FUSE BASE 32A	11
		Indicating Lamp	2
		CURRENT TRANSFORMER (PROTECTION) 10VA,CL-5P20	3
		NEUTRAL LINK 32A	1
		CONTROL TERMINALS(FIXED)	As required
		CT SHORTING TERMINAL-STUD TYPE	As required
		POWER TERMINAL	As required
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF BREAKER MOTOR FDR-12A, 240VAC	1
		DOUBLE POLE ON/OFF SWITCH-16 A,220 V DC	1
		NUMERICAL RELAY WITH COMMUNICATION FACILITY AS PER IEC-61850 FOR FOLLOWING FUNCTIONS:	1
		• SHORT CIRCUIT PROTECTION (51I)	
		• EARTH FAULT PROTECTION (51N)	
		• OVER LOAD PROTECTION	
		UNDER VOLTAGE	
		• EARTH FAULT PROTECTION	
		• TRIP CIRCUIT SUPERVISION (95)	
		• CIRCUIT BREAKER MONITORING	
		• PT FUSE FAILURE	
		• ENERGY METERING	
		• CURRENT, VOLTAGE & FREQUENCY MEASUREMENT	
		• BLOCKED ROTOR PROTECTION	
		CURRENT UNBALANCE PROTECTION	
		• No of DI/DO SHALL BE AS PER SCHEME REQUIREMNET	
		• ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC ,HOWEVER THE THERSHOLD VALUE FOR BINARY INPUT SHALL BE 18V DC (+/- 5%)	
		CURRENT TRANSFORMER (METERING) with 10VA,CL-1.0	1
		ANALOG AMMETER	1
		HAND REST TYPE LOCKOUT RELAY(86)	1
		INTERPOSING RELAY REM302/EQVT. WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2



SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.
5	G1	BUS PT MODULE FOR PCC / PMCC SHALL COMPRISE OF:	
		CONTROL FUSE-6A	7
		FUSE BASE-32A	7
		POTENTIAL TRANSFORMER -415/ROOT3 /110/ROOT3, 50 VA CL-0.5 INSL CL-E	3
		VOLTMETER (AC),96 X 96 mm2, SCALE-90, CL-2.0,0-500V DIRECT	1
		VOLTMETER SELECTOR SWITCH	1
		NEUTRAL LINK-32A	1
		CONTROL TERMINALS(FIXED)	As required
6	CS	EACH CONTROL SUPPLY OUTGOING SHALL COMPRISE OF:	
		CONTROL FUSE-6A	4
		CONTROL FUSE-25A	4
		FUSE BASE-32A	8
		AUX. CONTACTOR , 2NO+2NC,CV. 110 V AC	4
		NEUTRAL LINK-32A	6
		CONTROL TERMINALS(FIXED)	As required
		POWER TERMINALS	As required
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/110 V	2
		4POLE,2POS, SELECTOR SWITCH FOR CONTROL TRF.-25A, 110V AC	2
7	EM3 (I/C)	INCOMER SFU FOR MLDB/ELDB UPTO 630A	
		CONTROL FUSE-6A	1
		FUSE BASE-32A	1
		3 POLES SFU	2
		AUX. SWITCH FOR SFU-2NO+1NC	4
		INDICATION LAMP	6
		NEUTRAL LINK 32A	1
		NEUTRAL LINK AS PER SFU RATING	1
		AMMETER	1
		CURRENT TRANSFORMER (METERING) with 10VA,CL-1.0	3
		VOLTMETER(0-500V)	1
		VOLTMETER SELECTOR SWITCH(ROTARY TYPE)	1
		AMMETER SELECTOR SWITCH(ROTARY TYPE)	1
		AUXILIARY CONTACTOR 415VAC	2
		CONTROL TERMINALS (FIXED)	AS REQUIRED
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED
		415/433 3PH, DELTA / STAR WITH OFF CRICUIT WITH TAP LINK IN STEPS OF ±2.5% & ±5%, INSULATION : CLASS F, RESIN IMPEGRAED	1
8	EM3 (B/C)	BUSCOUPLER SFU FOR MLDB/ELDB UPTO 630A	
		AUX. SWITCH FOR SFU-2NO+1NC	1
		INDICATION LAMP	3
		NEUTRAL LINK 32A	1
		NEUTRAL LINK AS PER MCCB RATING	
		AUXILIARY CONTACTOR	2
		CONTROL FUSES-6A	2
		FUSE BASE-32A	2
		NEUTRAL LINK	2
		CASTLE KEY	3
9	E/E3	TPN AC OUTGOING SFU OPERATED FEEDER	
		3 POLES SFU	1
		POWER FUSE	3
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
		Aux. switch for SFU 1NO+1NC	1
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
10	E2	DP AC OUTGOING SFU OPERATED FEEDER	
		2POLES SFU	1
		POWER FUSE	2
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
		Aux. switch for SFU 1NO+1NC	1
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
11	E1	SP OUTGOING SFU OPERATED FEEDER	
		2POLES SFU	1
		POWER FUSE	2
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
		Aux. switch for SFU 1NO+1NC	1
		NETURAL LINK EQUIVALENT TO POWER FUSE RATING	1
12	DK2/PK2/ AK2	UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (AU/BU/CU CONTROLLED FROM ATRS/DDCMIS/PLC SHALL COMPRISE OF:	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-6A	1
		FUSE BASE-32A	1
		POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	2
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1
		OVERLOAD RELAY,BUILT IN SPPR FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	1
		MOUNTING KIT FOR O/L RELAY	1
		RESET CORD ACTUATOR	1
		Indication lamp	3
		NEUTRAL LINK-32A	1
		CONTROL TERMINALS (DRAWOUT)	30
		COUPLING RELAY WITH BUILT IN DIODE,24V DC 2C/O	2
		TEST PUSH BUTTON	1



SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.
13	DK21/PK21/ AK21	UNIDIRECTIONAL MOTOR FEEDER 30KW & ABOVE UPTO 90KW CONTROLLED FROM DDCMIS/PLC/ATRS SHALL COMPRISE OF:	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-6A	6
		FUSE BASE-32A	6
		POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		AUX. CONTACTOR,2NO+2NC CV. 110 V AC	2
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1
		Electronic Motor Protection Relay	1
		Indication lamp	3
		CURRENT TRANSFORMER (METERING) 10VA, CL-1	1
		ANALOG AMMETER WITH 96 X 96 mm2,	1
		CURRENT TRANSDUCER WITH DUAL OUTPUT	1
		NEUTRAL LINK	1
		CONTROL TERMINALS (DRAWOUT)	50
		CT SHORTING TERMINAL-STUD TYPE	18
		SP ON/OFF SWITCH FOR MOTOR SPACE HTR. OF MOTOR FDR.,10A, 240VAC	1
		COUPLING RELAY WITH BUILT IN DIODE,24V DC 2C/O	2
		TEST PUSH BUTTON	1
14	DN1	BIDIRECTIONAL MOTOR FEEDER	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-6A	1
		FUSE BASE-32A	1
		POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	2
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	3
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	1
		MOUNTING KIT FOR O/L RELAY	1
		RESET CORD ACTUATOR	1
		Indication lamp	3
		NEUTRAL LINK-32A	1
		CONTROL TERMINALS (DRAWOUT)	30
		COUPLING RELAY WITH BUILT IN DIODE,24V DC 2C/O	3
		TEST PUSH BUTTON	1
15	RM	RAPING MOTOR	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-4A	1
		FUSE BASE-32A	1
		POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	1
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	1
		MOUNTING KIT FOR O/L RELAY	1
		RESET CORD ACTUATOR	1
		Indication lamp	3
		NEUTRAL LINK-32A	1
		CONTROL TERMINALS (DRAWOUT)	30
		AUTO/Manual selector switch 10A	1
16	DDM	DUST DENSITY MONITORS	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-4A	2
		FUSE BASE-32A	1
		POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	2
		AUX. CONTACTOR,2NO+2NC, CV. 110 V AC	2
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC AUX. & INDEPENDENT MOUNTING TYPE	2
		MOUNTING KIT FOR O/L RELAY	2
		RESET CORD ACTUATOR	2
		Indication lamp	4
		NEUTRAL LINK-32A	2
		CONTROL TERMINALS (DRAWOUT)	30
		Rotary On/OFF Switch	1
17	HH	HOPPER HEATER	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-4A	1
		FUSE BASE-32A	1
		3P POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		Indication lamp	2
		Current Transformer	3
		NEUTRAL LINK-32A	1
		Ammeter	1
		Ammeter Selector Switch	1
		Rotary On /off Switch 16A	1
		CONTROL TERMINALS (DRAWOUT)	As required
		CT Shorting Link	As required



SL NO	MODULE TYPE	ITEM DESCRIPTION	QTY.
18	HS	SHAFT INSULATOR HEATER	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-4A	1
		FUSE BASE-32A	1
		3P POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		Indication lamp	2
		Current Transformer	3
		NEUTRAL LINK-32A	1
		Ammeter	1
		Ammeter Selector Switch	1
		CONTROL TERMINALS (DRAWOUT)	As required
		Rotary On /off Switch 16A	1
19	HI	SUPPORT INSULATOR HEATER	
		(TP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	3
		CONTROL FUSE-4A	1
		FUSE BASE-32A	1
		3P POWER CONTACTOR(AC) WITH 2NO+2NC AUX CONTACT COIL VOLTAGE 110V AC	1
		Indication lamp	2
		Current Transformer	3
		NEUTRAL LINK-32A	1
		Ammeter	1
		Ammeter Selector Switch	1
		CONTROL TERMINALS (DRAWOUT)	As required
		Rotary On /off Switch 16A	1
20	ALI(H)	ASH LEVEL INDICATOR (HIGH)	
		(DP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	2
		Aux. Contactor 2NO+2NC,240VAC	7
		Indication Lamp	8
		Push Button with 1NC CONTACT	1
		CONTROL TERMINALS (Fixed)	As required
21	ALI(L)	ASH LEVEL INDICATOR (LOW)	
		(DP)SWITCH FUSE UNIT	1
		AUX. CONTACT FOR SFU (1NO+1NC)	1
		HRC FUSE (POWER)	2
		Aux. Contactor 2NO+2NC,240VAC	7
		Indication Lamp	8
		Push Button with 1NC CONTACT	1
		CONTROL TERMINALS (Fixed)	As required
22	ARECA	ARECA MARSHALING MODULE	
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,110/24V	1
		CONTROL TERMINALS (Fixed)	As required
23	MM	MARSHALING MODULE FOR SSPB OF RAPING MOTOR AND HOPPER HEATER FEEDBACK	
		CONTROL TERMINALS (Fixed)	As required
24	SH	EACH CONTROL SUPPLY OUTGOING SHALL COMPRISE OF:	
		CONTROL FUSE-16A	4
		CONTROL FUSE-63A	4
		FUSE BASE-63A	8
		Indication Lamp	2
		NEUTRAL LINK-32A	6
		Rotary two source selector Switch	1
		CONTROL TERMINALS(FIXED)	As required
		POWER TERMINALS	As required
		CONTROL TRANSFORMER,DRY TYPE, CAST RESIN,415/240V	1
25	CS-A	EACH CONTROL SUPPLY OUTGOING SHALL COMPRISE OF:	
		CONTROL FUSE-16A	4
		CONTROL FUSE-63A	4
		FUSE BASE-63A	8
		POWER CONTACTOR , 2NO+2NC,CV. 110 V AC	1
		Indication Lamp	4
		NEUTRAL LINK-32A	6
		Rotary On/OFF Switch	1
		CONTROL TERMINALS(FIXED)	As required
		POWER TERMINALS	As required
26	E3 (I/C)	INCOMER SFU UPTO 630A	
		CONTROL FUSE-6A	1
		FUSE BASE-32A	1
		3 POLES SFU	1
		AUX. SWITCH FOR SFU-2NO+1NC	1
		INDICATION LAMP	3
		NEUTRAL LINK 32A	1
		NEUTRAL LINK AS PER SFU RATING	1
		AMMETER	1
		CURRENT TRANSFORMER (METERING) with 10VA,CL-1.0	3
		VOLTMETER(0-500V)	1
		VOLTMETER SELECTOR SWITCH(ROTARY TYPE)	1
		AMMETER SELECTOR SWITCH(ROTARY TYPE)	1
		CONTROL TERMINALS (FIXED)	AS REQUIRED
		CT SHORTING TERMINAL-STUD TYPE	AS REQUIRED
27	VM	BUS PT MODULE FOR EPDB/ELDB/MLDB	
		CONTROL FUSE-6A	3
		FUSE BASE-32A	3
		AUX. CONTACTOR 2NO+2NC CV. 415 V AC	1
		VOLTMETER (AC),96 X 96 mm2, SCALE-90, CL-1.5,0-500V DIRECT	1
		VOLTAGE TRANSDUCER (AC),4-20 m A DUAL O/P AUX. 220 V DC,0-500/4-20mA, 415V DIRECT	1
		VOLTMETER SELECTOR SWITCH-12 A,415 V AC	1



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-D)**

SPECIFICATION NO. EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 28.05.2018

SHEET : 1 OF 1

**ANNEXURE-D
UNIT PRICE SCHEDULE**



**NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)**

Annexure-D
UNIT PRICE SCHEDULE

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	UNIT PRICE (Rs.)
1	INCOMING FEEDER UNIT		
a)	ACB Incomer to PCC/PMCC from Trafo. - Module Type DAET (I/C)		
	630A		
	1000A		
	1600A		
	2000A		
	2500A		
	3000A		
	4000A		
b)	SFU Incomer for MLDB/ELDB – Module Type EM3 (I/C)		
	200A – Fixed Type		
	125A – Fixed Type		
	200A – Fixed Type		
	250A – Fixed Type		
	400A – Fixed Type		
	630A – Fixed Type		
	125A – Drawout Type		
	200A – Drawout Type		
	200A – Drawout Type		
	250A – Drawout Type		
	400A – Drawout Type		
	630A – Drawout Type		
c)	SFU Incomer for MCC / ACDB – Module Type E3 (I/C)		
	Upto 63A – Fixed Type		
	Upto 63A – Drawout Type		
2	BUSCOUPLER UNIT		
a)	ACB Buscoupler to PCC/PMCC/MCC from Trafo. - Module Type DAET/ DAE (B/C)		
	630A		
	800A		
	1000A		
	1600A		
	2000A		
	2500A		
	3000A		
	4000A		
b)	SFU Buscoupler for MLDB – Module Type EM3 (B/C)		
	Upto 63A – Fixed Type		
	125A – Fixed Type		
	200A – Fixed Type		
	200A – Fixed Type		
	250A – Fixed Type		
	400A – Fixed Type		
	630A – Fixed Type		
	Upto 63A – Drawout Type		
	125A – Drawout Type		
	200A – Drawout Type		
	200A – Drawout Type		
	250A – Drawout Type		
	400A – Drawout Type		
	630A – Drawout Type		
3	Outgoing ACB supply feeder - Module Type DAE/DAE-TIE (O/G)		
	630A		
	800A		
	1000A		
	1600A		
	3000A		
4	Outgoing ACB motor feeder - Module Type DM/PM (controlled from DDCMIS/PLC)		
	90.1- 200KW		
5	DOL Motor Starter - Unidirectional Drive(SFU CONTROLLED) - Drawout Type		
a)	Module Type DK2/PK2/AK2 (Controlled from DDCMIS/PLC/ATRS)		
	Upto 5.5KW		
	5.6 - 7.0KW		
	7.1 - 13KW		
	13.1 - 24KW		



**NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)**

Annexure-D
UNIT PRICE SCHEDULE

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	UNIT PRICE (Rs.)
	24.1 – 29.9KW		
b)	Module Type DK21/PK21/AK21 (Controlled from DDCMIS/PLC/ATRS)		
	30.0 - 37.0KW		
	37.1 - 40KW		
	40.1 - 50.0KW		
	50.1 - 75KW		
	75 - 90KW		
6	RDOL Motor Starter – Bidirectional Drive(SFU CONTROLLED) Drawout Type		
a)	Module Type DN1/ PN1/ AN1 (Controlled from DDCMIS/PLC/ATRS)		
	Upto 5.5KW		
	5.6 - 7.0KW		
	7.1 - 13KW		
	13.1 - 24KW		
	24.1 – 29.9KW		
7	Outgoing MCCB/ SFU controlled feeders		
a)	Outgoing SFU controlled supply feeder - Module Type E3 (O/G)		
	upto 10A - Fixed type		
	16A - Fixed type		
	25A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	125A - Fixed type		
	160A - Fixed type		
	200A - Fixed type		
	250A - Fixed type		
	400A - Fixed type		
	600A - Fixed type		
	upto 10A - Drawout type		
	16A - Drawout type		
	25A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
	125A - Drawout type		
	160A - Drawout type		
	200A - Drawout type		
	250A - Drawout type		
	400A - Drawout type		
	600A - Drawout type		
b)	Outgoing MCCB controlled supply feeder - Module Type E3 (O/G)		
	16A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	125A - Fixed type		
	160A - Fixed type		
	200A - Fixed type		
	250A - Fixed type		
	400A - Fixed type		
	600A - Fixed type		
	16A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
	125A - Drawout type		
	160A - Drawout type		
	200A - Drawout type		
	250A - Drawout type		
	400A - Drawout type		
	600A - Drawout type		
c)	Double pole SFU controlled 1-ph feeder - E1 (O/G)		
	10A - Fixed type		
	16A - Fixed type		
	25A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	10A - Drawout type		
	16A - Drawout type		
	25A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
d)	Double pole MCCB controlled 1-ph feeder - E1 (O/G)		
	16A - Fixed type		
	32A - Fixed type		



NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)

Annexure-D
UNIT PRICE SCHEDULE

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	UNIT PRICE (Rs.)
	63A - Fixed type		
	125A - Fixed type		
	16A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
	125A - Drawout type		
e)	1-Ph SFU controlled outgoing contactor feeder (EA1)		
	10A - Fixed type		
	16A - Fixed type		
	25A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	10A - Drawout type		
	16A - Drawout type		
	25A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
f)	1-Ph MCCB controlled outgoing contactor feeder (EA1)		
	16A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	16A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
g)	3-Ph SFU controlled outgoing contactor feeder (EA3)		
	10A - Fixed type		
	16A - Fixed type		
	25A - Fixed type		
	32A - Fixed type		
	63A - Fixed type		
	125A - Fixed type		
	200A - Fixed type		
	250A - Fixed type		
	400A - Fixed type		
	600A - Fixed type		
	10A - Drawout type		
	16A - Drawout type		
	25A - Drawout type		
	32A - Drawout type		
	63A - Drawout type		
	125A - Drawout type		
	200A - Drawout type		
	250A - Drawout type		
	400A - Drawout type		
	600A - Drawout type		
7	Common Auxiliary Module		
a)	PT module		
i	Bus PT module for PCC/PMCC-G1 Type		
ii	Bus PT module for MLDB/ELDB VM TYPE		
b)	Space heater and Power Socket - TT		
c)	110V AC control supply module – Type CS (consisting of 415/110V control Trafo.)		
	1KVA		
	2KVA		
	2.5KVA		
	3KVA		
	5KVA		
	7.5KVA		
	10KVA		
d)	110V AC control supply module – Type CS-A (consisting of 415/110V control Trafo.)		
	1KVA		
	2KVA		
	2.5KVA		
	3KVA		
	5KVA		
	7.5KVA		



NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)

Annexure-D
UNIT PRICE SCHEDULE

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	UNIT PRICE (Rs.)
	10KVA		
e)	240 V AC Panel Space hetaing supply module – type SH (consisting of 415/240V control Trafo.)		
	1KVA		
	2KVA		
	2.5KVA		
	3KVA		
	5KVA		
	7.5KVA		
	10KVA		
	8 Empty Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar		
a)	MCC Panel (Double Front Drawout Type)		
	250 / 250A		
	400 / 400A		
	630 / 630A		
	800 / 630A		
	1000 / 630A		
	1600 / 630A		
	2000 / 630A		
	2500 / 630A		
	3000 / 630A		
	4000 / 630A		
b)	MCC Panel (Double Front Fixed Type)		
	250 / 250A		
	400 / 400A		
	630 / 630A		
	800 / 630A		
	1000 / 630A		
	1600 / 630A		
	2000 / 630A		
	2500 / 630A		
	3000 / 630A		
	4000 / 630A		
c)	220V DCDB Panel (Double Front Fixed type)		
	UPTO 630A (with 630A VBB)		
	1000A (with 630A VBB)		
	1600A (with 630A VBB)		
d)	220V DCDB Panel (Double Front Drawout type)		
	UPTO 630A (with 630A VBB)		
	1000A (with 630A VBB)		
	1600A (with 630A VBB)		
	9 Empty Panel With Horizontal & Vertical Busbar, Support & Auxiliary Busbar		
a)	PCC Panel (Single Front Drawout Type)		
	1600 / 1600A		
	2000 / 2000A		
	2500 / 2500A		
	3000 / 3000A		
	4000 / 4000A		
b)	MCC Panel (Single Front Drawout Type)		
	250 / 250A		
	400 / 400A		
	630 / 630A		
	800 / 630A		
	1000 / 630A		
	1600 / 630A		
	2000 / 630A		
	2500 / 630A		
	3000 / 630A		
	4000 / 630A		
c)	MCC Panel (Single Front Fixed Type)		
	250 / 250A		
	400 / 400A		
	630 / 630A		
	800 / 630A		
	1000 / 630A		



NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)

Annexure-D
UNIT PRICE SCHEDULE

SL.NO.	ITEM DESCRIPTION	MODEL NO./ ITEM DESCRIPTION	UNIT PRICE (Rs.)
	1600 / 630A		
	2000 / 630A		
	2500 / 630A		
	3000 / 630A		
	4000 / 630A		
d)	220V DCDB Panel (Single Front Fixed Type)		
	UPTO 630A (with 630A VBB)		
	1000A (with 630A VBB)		
	1600A (with 630A VBB)		
e)	220V DCDB Panel (Single Front Fixed Type)		
	UPTO 630A (with 630A VBB)		
	1000A (with 630A VBB)		
	1600A (with 630A VBB)		
10	ACB Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar		
	630 / 630A		
	800 / 630A		
	800 / 800A		
	1000 / 630A		
	1000 / 800A		
	1000 / 1000A		
	1600 / 630A		
	1600 / 800A		
	1600 / 1000A		
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	3000 / 800A		
	3000 / 1000A		
	3000 / 1600A		
	3000 / 2000A		
	3000 / 2500A		
	3000 / 3000A		
	4000 / 630A		
	4000 / 800A		
	4000 / 1000A		
	4000 / 1600A		
	4000 / 2000A		
	4000 / 2500A		
	4000 / 3000A		
	4000 / 4000A		
11	Dummy Panel		
	UPTO 630A		
	800A		
	1000A		
	1600A		
	2000A		
	2500A		
	3000A		
	4000A		



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-E1)**

SPECIFICATION NO. EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 28.05.2018

SHEET : 1 OF 1

ANNEXURE-E1

E&C SPARE FOR CHP & AHP PACKAGE



1	FACTORY BUILT ASSEMBLIES (PCC/MCC/DB)			
1.1	Busbar supports (Horizontal)	1 set of 3	1SET	1
1.2	Primary isolating contacts (Bus side)	1 set of 3	1SET	
	100A	1 set of 3		1
	250A	1 set of 3		1
	400A	1 set of 3		1
1.3	Primary isolating contacts (Load side)	1 set of 3	1SET	
	100A	1 set of 3		1
	250A	1 set of 3		1
	400A	1 set of 3		1
1.4	Secondary isolating contacts	1 set of 3	1SET	
	100A	1 set of 3		1
	250A	1 set of 3		1
	400A	1 set of 3		1
1.5	Gaskets (each size)	Meter	10	10
1.6	Fixed Terminal (1way)	Nos.	20	20
1.7	Shrouds (for outgoing modules)	Nos. (of each physical size of module)	one for each physical size of module	1
1.8	Wire (for secondary wiring)			
a.	2.5 mm ²	Metres	100	100
b.	1.5mm ²	Metres	100	100
1.9	Lugs (for secondary wiring)	Nos.	100	100
2	Air Circuit Breaker			
2.1	Shunt trip coil	Nos	1	1
	800A	No		1
	1600A	No		1
	2000A	No		1
	2500A	No		1
	4000A	No		1
2.2	spring charging motor	Nos.	1 motor of each rating	1 motor of each rating
	630A-1600A	No		3
	2000A-4000A	No		3
2.3	closing coil	Nos.	1	1
	800A	No.		1
	1600A	No.		1
	2000A	No.		1
	2500A	No.		1
	4000A	No.		1
2.4	Auxiliary switch	Nos.	1	1
3	ISOLATING SWITCH			
3.1	Main contact kit for each rating		1	1 set of 3 poles
	32A	No		1
	63A	No		1
	125A	No		1
	400A	No		1
4	POWER CONTACTORS			
4.1	Contactor coil (110V AC)		1	
	16A	No.		1
	32A	No.		1
	63A	No.		1
	80A	No.		1
	115A	No.		1
	185A	No.		1
	265A	No.		1
	400A	No.		1
4.2	Contacts kit (main)		1	1 set of 3 poles
	16A	No.		1



	32A	No.		1
	63A	No.		1
	80A	No.		1
	115A	No.		1
	185A	No.		1
	265A	No.		1
	400A	No.		1
5	AUXILIARY CONTACTORS			
5.1	Complete unit with 2NO + 2NC contacts		1 no. of each rating/type	1 no. of each rating / type
	2NO + 2NC AC	No		1
	2NO + 2NC DC	No		1
5.2	Contactor coils			
a.	110V AC	No	1	1
b.	220 V DC	No	1	1
6	HRC FUSE			
6.1	Fuse base (each rating)	No	1	1
6.2	Fuse link:			
a.	UPTO 40A	Nos.	10	10
b.	63A TO 200A	Nos.	10	10
c.	250A TO 400A	Nos.	5	5
7	PUSH BUTTONS			
6.1	Actuator contacts	Nos.	5	5
6.2	Element	Nos.	5	5
8	INDICATING CLUSTER LED			
8.1	Complete unit	Nos.	10	10
9	OTHERS			
9.1	Selector & control switch (each type)	Nos	1	1
	ASS	No		1
	VSS	No.		1
	Breaker Control Switch	No.		1
	Local Remote	No.		1
	2P 2A ON/OFF	No.		1
9.2	AC Voltmeter (0-500V)	No.	1	1



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LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)
(ANNEXURE-E2)**

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ANNEXURE-E2

E&C SPARE FOR ESP PACKAGE



SL.NO	Description	Rating	unit	Total Qty	UNIT PRICE	TOTAL PRICE
1	POWER FUSE LINK FOR RAPPING MOTOR FEEDER	6A	EA	20		
2	POWER FUSE LINK FOR SHAFT INSULATOR FEEDER	16A	EA	6		
3	POWER FUSE LINK FOR HOPPER HEATER FEEDER	32A	EA	20		
4	POWER FUSE LINK FOR EOH FEEDER	32A	EA	3		
5	CONTROL FUSE LINK(COMPLETE SET)	4A	SET	3		
6	POWER FUSE LINK ASH LEVEL HIGH FEEDER	6A	EA	9		
7	INDICATING LAMP WITH LENS ASSEMBLY - RED	110VAC	EA	10		
8	INDICATING LAMP WITH LENS ASSEMBLY- GREEN	110VAC	EA	10		
9	INDICATING LAMP WITH LENS ASSEMBLY- AMBER	110VAC	EA	10		
10	DRAWOUT CONTROL TERMINAL BLOCKS (FIXED)		SET	10		
11	DRAWOUT CONTROL TERMINAL BLOCKS (MOVING)		SET	10		
12	BREAKER DRAWOUT HANDLE		EA	8		
13	BREAKER HANDLING TROLLEY		EA	1		
14	300MM DUMMY PANEL	3200A	EA	4		
15	POWER FUSE FOR OPACITY MONITOR FEEDER	10A	EA	6		
16	Insulated fuse pulling handle		EA	8		



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ANNEXURE-F1

MANDATORY SPARE FOR CHP & AHP PACKAGE



GROUP-A

S.no.	Item Description	Quantity
	None	

GROUP-B

S.no.	Item Description	Quantity
1	Complete breaker	3 Nos. of each type & rating
2	Ammeter	2 Nos. of each type,size & range
3	Voltmeter	2 Nos. of each type,size & range
4	Relays	2 Nos. of each type
5	Bus bar support insulators(porcelain)	10 Nos.

GROUP-C

S.no.	Item Description	Quantity
1	Spring charging motors	3 Nos. of each type & rating
2	Aux. Contact set	6 Sets of each type & rating
3	Limit switches	10 Nos.
4	Arc chutes (EACH SET CONSIST OF 3 POLE)	4 Nos. of each type & rating
5	Fixed contact set (EACH SET CONSIST OF 3 POLE)	6 Sets of each type & rating
6	Moving contact set (EACH SET CONSIST OF 3 POLE)	6 Sets of each type & rating
7	Arcing contact (EACH SET CONSIST OF 3 POLE)	6 Sets of each type
8	Charging spring	4 Nos. of each type & rating
9	Current transformer	3 Nos. of each type & ratio
10	Closing coil	12 Nos. of each type & rating
11	Trip coil	12 Nos. of each type & rating
12	CT for Bimetal O/L relays	3 Nos. of each type & rating
13	Voltage transformer	3 Nos. of each type & ratio
14	Control supply transformer	3 Nos. of each type & rating
15	(a) Power contactor	2 Nos. of each type & rating
	(b) Coil of above contactor	2 Nos. of each type & rating
16	Air break switches	3 Nos. of each type & rating
17	DP air break switches(DC)	3 Nos. of each type & rating
18	Control & selector switches	5 Nos. of each type & rating
19	Control fuses & neutral links	Total 50 Nos.(Fuses) & 10 Nos. (Neutral links), to cover all the ratings.
20	Indicating lamps	Total 50 Nos. to cover all the types & ratings
21	Vertical bus bar dropper support insulators(FRP)	25 Nos.



22	Bus duct flexible connectors	1 Set for three phases of each type & size
23	(a) Primary disconnect in MCC(Bus bar end) (Male/female contact	Total 15 Nos. proportionately divide for all ratings
	(b) Secondary disconnect in MCC(Cable end)	Total 15 Nos. proportionately divide for all ratings
24	Push buttons	15 Nos.
25	Power fuses	Total 100 Nos. proportionately divide for all ratings
26	Thermal Bimetal relays	Total 30 Nos. proportionately divide for all ratings
27	Current transducers	12 Nos. proportionately divide for all ratings
28	Voltage transducers	12 Nos. proportionately divide for all ratings
29	Indication lamp holders complete	10% of each type & rating
30	Busbar aluminium flat pieces	12 meters of each type & rating
31	Busbar angles/formed pieces for breaker	2 Nos. of each type
32	Terminal blocks	12 Nos. of each type & rating



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ANNEXURE-F2

MANDATORY SPARE FOR ESP PACKAGE



SL.NO	Description	Rating	unit	Total Qty	UNIT PRICE	TOTAL PRICE
1	AIR CIRCUIT BREAKER - 3200A COMPLETE SET	3200A	NO	1		
2	AIR CIRCUIT BREAKER - 630A COMPLETE SET	630A	NO	1		
3	SPRING CHARGING MOTORS FOR 3200A ACB	3200A	NO	2		
4	SPRING CHARGING MOTORS FOR 630A ACB.	630A	NO	2		
5	AUX. CONTACT SET FOR 3200A ACB.	3200A	ST	3		
6	AUX. CONTACT SET FOR 630A ACB	630A	ST	3		
7	LIMIT SWITCHES FOR 3200A ACB, (TEST POSITION & SERVICE POSITION)	3200A	ST	3		
8	LIMIT SWITCHES FOR 630A ACB (TEST POSITION & SERVICE POSITION)	630A	ST	3		
9	ARC CHUTES FOR 3200A ACBS (EACH SET CONSIST OF 3 POLE)	3200A	ST	3		
10	ARC CHUTES FOR 630A ACBS (EACH SET CONSIST OF 3 POLE)	630A	ST	3		
11	FIXED CONTACT SET FOR 3200 ACB (EACH SET CONSIST OF 3 POLE)	3200A	ST	3		
12	FIXED CONTACT SET FOR 630A ACB (EACH SET CONSIST OF 3 POLE)	630A	ST	3		
13	MOVING CONTACT SET FOR 3200A ACB.(EACH SET CONSIST OF 3 POLE)	3200A	ST	3		
14	MOVING CONTACT SET FOR 630A ACB. (EACH SET CONSIST OF 3 POLE)	630A	ST	3		
15	ARCING CONTACT FIXED FOR 3200A ACBS (EACH SET CONSIST OF 3 POLE)	3200A	ST	3		
16	ARCING CONTACT FIXED FOR 630A ACBS (EACH SET CONSIST OF 3 POLE)	630A	ST	3		
17	ARCING CONTACT MOVING FOR 3200A ACBS (EACH SET CONSIST OF 3 POLE)	3200A	ST	3		
18	ARCING CONTACT MOVING FOR 630A ACBS (EACH SET CONSIST OF 3 POLE)	630A	ST	3		
19	CHARGING SPRING FOR 3200A ACB	3200A	NO	2		
20	CHARGING SPRING FOR 630A ACB	630A	NO	2		
21	CURRENT TRANSFORMER (METERING) 25/1A,15VA,CL-1.	25/1A	NO	3		
22	CURRENT TRANSFORMER (METERING) 60/1A,15VA,CL-1.	60/1A	NO	3		
23	CURRENT TRANSFORMER (PROTECTION) 3000/1A,15VA,CL-1.	3000/1A	NO	3		
24	CURRENT TRANSFORMER (PROTECTION) 630/1A,15VA,CL-1.	630/1A	NO	3		
25	CLOSING COIL FOR 3200A ACB	3200A	NO	3		
26	CLOSING COIL FOR 630A ACB	630A	NO	3		
27	TRIP COIL FOR 3200A ACB	3200A	NO	3		
28	TRIP COIL FOR 630A ACB	630A	NO	3		
29	VOLTAGE TRANSFORMER,415/110V,100VA,CL-1.	100VA	NO	2		
30	CONTROL SUPPLY TRANSFORMER,415V/110V,5KVA, CL-B.	5KVA	NO	1		
31	CONTROL SUPPLY TRANSFORMER,415V/240V,3KVA, CL-B.	3KVA	NO	1		
32	CONTROL SUPPLY TRANSFORMER,110V/24V,150VA, CL-B.	150VA	NO	1		
33	AMMETER 0-25A, 96SQMM. AC CT RATIO - 25/1A.	0-25A	NO	2		
34	AMMETER (0-50A), 96SQMM. AC CT RATIO 50/1A	0-50A	NO	2		
35	VOLTMETER,AC,0-500V,96SQ.MM.	0-500V	NO	2		
36	NUMERICAL RELAY COMPLETE SET (1 NO IN EACH TYPE)		NO	1		
37	POWER CONTACTORS 16A	16A	NO	1		
38	POWER CONTACTORS 32A	32A	NO	1		
39	POWER CONTACTORS 25A	25A	NO	1		
40	POWER CONTACTORS 63A	63A	NO	1		
41	COILS FOR POWER CONTACTORS 16A	16A	NO	2		
42	COILS FOR POWER CONTACTORS 32A	32A	NO	2		
43	COILS FOR POWER CONTACTORS 25A	25A	NO	2		
44	COILS FOR POWER CONTACTORS 63A	63A	NO	2		
45	CONTROL TERMINAL BLOCKS		ST	8		
46	POWER & CONTROL CIRCUIT FUSES (EACH TYPE & RATING)		NO	10		
47	FSU 400A	400A	NO	2		
48	FSU 250A	250A	NO	2		
49	FSU 100A	100A	NO	2		
50	FSU 63A	63A	NO	2		
51	FSU 32A	32A	NO	2		
52	DP AIR BREAK SWITCHES (DC) EACH TYPE & RATING		NO	2		
53	CONTROL SWITCHES OF EACH TYPE & RATING		NO	3		
54	SELECTOR SWITCHES EACH TYPE & RATING		NO	3		
55	INDICATING LAMP HOLDERS		NO	25		
56	NEUTRAL LINKS (EACH TYPE & RATING)		NO	10		
57	INDICATING LAMPS LED CLUSTERED TYPE,110V,AC-RED.	110VAC	NO	4		
58	INDICATING LAMPS LED CLUSTERED TYPE,110V,AC -GREEN.	110VAC	NO	4		
59	INDICATING LAMPS LED CLUSTERED TYPE,110V,AC-BLUE.	110VAC	NO	4		
60	INDICATING LAMPS LED CLUSTERED TYPE,110V,AC AMBER.	110VAC	NO	4		
61	INDICATING LAMPS LED CLUSTERED TYPE,110V,AC WHITE.	110VAC	NO	4		
62	INDICATING LAMPS LED CLUSTERED TYPE,240V,AC-RED.	240VAC	NO	4		
63	BUS BAR SUPPORT INSULATORS (EACH TYPE)		NO	10		
64	VERTICAL BUS BAR SUPPORT INSULATORS (EACH TYPE)		NO	10		
65	INDICATING LAMP LENS COVER (RED,GREEN,AMBER EACH)		NO	5		
66	PUSH BUTTONS WITH ACTUATORS- RED		NO	5		
67	PUSH BUTTONS WITH ACTUATORS- GREEN		NO	5		
68	PUSH BUTTONS WITH ACTUATORS - BLACK		NO	5		
69	MULTIPLICATION RELAY		NO	2		
70	LOCKOUT RELAY		NO	2		
71	INTERPOSING RELAY		NO	2		
72	CURRENT TRANSDUCER 3000A/1A (WITH 4- 20MA DUAL OUTPUT)		NO	2		
73	VOLTAGE TRANSDUCER 415V (WITH 4-20MA DUAL OUTPUT)		NO	2		
74	PRIMARY DISCONNECT IN MCC (MALE/FEMALE CONTACT) FOR EACH FEEDER.		NO	3		
	315A			3		
	250A			3		
	125A			3		
	63A			3		
75	SECONDARY DISCONNECT IN MCC (MALE/FEMALE CONTACT) FOR EACH FEEDER.		NO	3		
	315A			3		
	250A			3		



	125A			3		
	63A			3		
76	BUSBAR ALUMINUM FLAT PIECES FOR HORIZONTAL MAIN BUS.		MR	5		
77	BUSBAR ALUMINUM FLAT PIECES FOR HORIZONTAL NEUTRAL BUS.		MR	5		
78	BUSBAR ALUMINUM FLAT PIECES FOR VERTICAL BUS.		MR	5		
79	BUSBAR ALUMINUM FLAT PIECES FOR CONTROL BUS BAR COPPER.		MR	5		
80	BUSBAR ANGLES/FORMED PIECE FOR BREAKER		ST	1		



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(ANNEXURE-G)**

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ANNEXURE-G

SITE MODIFICATION/VISIT CHARGE



**NSPCL ROURKELA POWER PROJECT
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ANNEXURE-G

SITE MODIFICATION CHARGES

(SL No. 11 of Main Price list)

SL.NO.	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SKILLED TECHNICIAN (EXCEPT DAILY CHARGES)	2 VISITS		
2	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SKILLED TECHNICIAN	10 DAYS		
3	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	3 VISITS		
4	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SERVICE ENGINEER	15 DAYS		
			TOTAL	

NOTES:

- 1) AMOUNT PAYABLE FOR SKILLED TECHNICIAN PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (DAILY CHARGES AS PER SL. NO. 2 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)
- 2) AMOUNT PAYABLE FOR SERVICE ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 3 ABOVE + (DAILY CHARGES AS PER SL. NO. 4 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)



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ANNEXURE-H

Commission charges for Numerical Relay



**NSPCL ROURKELA POWER PROJECT
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ANNEXURE-H

**COMMISSIONING CHARGES FOR NUMERICAL RELAYS
AT SITE (SL No.12 of Main Price list)**

SNO	DETAILS	QUANTITY	UNIT PRICE	TOTAL PRICE
1	LUMP SUM ALL INCLUSIVE CHARGES PER NUMERICAL RELAY COMMISSIONING (INCLUDING CONVEANCE TO SITE, BOARDING AND LOADGING)	35		

NOTE:

AMOUNT PAYABLE FOR NUMERICAL RELAY COMMISSIONING =UNIT PRICE FOR
COMMISSIONING CHARGES AS PER SL.NO.1 ABOVE x NO. OF RELAYS COMMISSIONED
(SAME TO BE CERTIFIED BY BHEL)



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(ANNEXURE-I)**

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**ANNEXURE-I
TOOLS & TACKLES**



NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP – III : 1X250 MW)

Annexure-I
TOOLS TACKLES

SL. NO.	ITEM DESCRIPTION	QUANTITY	UNIT PRICE(EX- WORKS) RS.	TOTAL PRICE(RS.)
1	ACB RACKING HANDLE	10.00		
2	MODULE RACKING HANDLE	30.00		
3	FUSE PULLERS	15.00		
4	TROLLEY FOR ACB HANDLING	2.00		
TOTAL				-



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ANNEXURE-K

DRAWINGS AND DOCUMENTS DISTRIBUTION SCHEDULE



**NSPCL ROURKELA POWER PROJECT
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(ANNEXURE-K)**

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ANNEXURE-K

NO. OF DRAWINGS/DOCUMENTS REQUIRED FROM VENDOR

SL.NO.	DESCRIPTION	PRINTS	CD-ROM	MANUALS
1	DRAWING /DOCUMENTS –FIRST SUBMISSION	3		
2	DRAWING /DOCUMENTS-SUBSEQUENT REVISED SUBMISSION	5		
3	DRAWING /DOCUMENTS-FINAL (AFTER CATEGORY –I APPROVAL)	5	5	
4	DRAWING AS BUILT	5	5	
5	O/M MANUAL-DRAFT			3
6	O/M MANUAL-FINAL		3	10
7	TYPE TEST CERTIFICATES	5		

ALL DRAWINGS SHALL BE SUBMITTED IN BOTH PDF AND AUTOCAD (.DWG 2004) FORMATS



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LIST OF CODES & STANDARDS

Notes:

1 Equipment, accessories, components, material and tests shall confirm, to the specifications of latest revision of applicable standards.

2 Equipment, accessories, components, material and tests shall confirm, in general, to the Specifications of

[√] S

[] BS

[] IEC

Unless marked otherwise in the list below. Applicable standards are to be ticked []

LV Switch gear: –

1	Switchgear General Requirements	[V] IS : 4237	[] BS : 162	[] IEC :
2	Factory built assemblies of LV Switchgear control gear	[V] IS : 8623	[] BS:5486	[] IEC : 439
3	Selection , installation and maintenance of switchgear and control gear	[V] IS : 10118	[] :	[] IEC :
4	Busbar main connections and accessories	[V] IS: 5578	[] BS : 159	[] IEC :
5	Rail mounting in switchgear and control gear installation	[V] IS :11039	[] BS :	[] IEC : 715
6	Marking and identification of conductor and apparatus terminal	[V] IS:11053	[] BS :	[] IEC :
7	Marking of insulated conductors	[V] IS: 5578	[] BS :	[] IEC : 391
8	Item designation	[V] IS :8270	[] BS :	[] IEC :
9	Climate proofing of electrical equipment	[V] IS: 3202	[] BS : CP 1014	[] IEC :
10	Degree of protection (enclosure)	[V] IS:13947	[] BS :	[] IEC : 144
11	Wrought aluminium & Al. alloys	[V] IS:5082	[] BS: 2898	[] IEC : 114
12	Copper of bus bars	[V] IS :	[] BS :	[] IEC : 28
13	LV circuit breakers	[V] IS :2516 Pt. I& II	[] BS: 4752 [] BS:3871 SEC 1	[] IEC : 157 -1
14	Starters	[V] IS : 8544	[]BS: 4941	[] IEC : 292-1
15	Identification of terminals of contractors and associated overload	[V] IS :10705	[]BS:	[] IEC : 158-1C
16	Air break switch	[V] IS :4064	[]BS: 5419	[] IEC : 408
17	Contactors	[V] IS:2959	[]BS: 775	[] IEC : 158-1
18	High Voltage Circuit Breakers	[V] IS:13703	[]BS: 88	[] IEC : 269-1



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19	Indicating instruments	[v] IS:1248	[] BS: 89	[] IEC : 51
20	Dimensions for panel mounted indicating instruments	[v] IS:2419	[] BS:	[] IEC :
21	AC electricity meters	[v] IS:722	[] BS: 5685	[] IEC : 521
22	Relays	[v] IS:3231	[] BS:142	[] IEC : 255
23	Static protective relays	[v] IS :8686	[] BS:	[] IEC :
24	Current transformers	[v] IS :2705	[] BS: 3938	[] IEC : 185
25	Voltage transformers	[v] IS: 3941	[] BS: 3941	[] IEC :
26	LV Control Transformers	[v] IS: 12021	[] BS :	[] IEC :
27	Miniature circuit breakers	[v] IS: 8828	[] BS : 3871	[] IEC :
28	Control switches & push button	[v] IS: 13947	[] BS:	[] IEC :
29	Thermostatic Bimetals	[v] IS: 8588	[] BS:	[] IEC :
30	Phosphating of iron & steel	[v] IS: 6005	[] BS: 3189	[] IEC :
31	"Colours for ready mixed paints and enamels"	[v] IS: 5	[] BS:	[] IEC :
32	Environmental tests	[v] IS: 2106	[] BS:	[] IEC :
33	Maintenance & field testing of relays	[v] IS:9124	[] BS:	[] IEC :
34	Specification for PVC insulated cables for working voltage upto & including 1100volts	[v] IS: 694	[] BS:	[] IEC :



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LPB & Local Starters:-

1	Factory built assemblies of LV Switchgear and control gear	☒ IS: 8623 PART -II	☐ BS :5486	☐ IEC : 439
2	Degree of protection	☒ IS: 13947	☐ BS :5420	☐ IEC : 144
3	Push button	☒ IS: 13947	☐ BS :	☐ IEC : 337
4	Climatic proofing of electrical equipment	☒ IS: 3202	☐ BS :CP1014	☐ IEC :
5	AC motors starters for voltage not exceeding 1000 V	☒ IS: 8544	☐ BS : 4941	☐ IEC : 292
6	Code of practice for phosphating iron & steel	☒ IS: 6005	☐ BS :3189	☐ IEC :
7	Colour for ready mixed paints & enamels	☒ IS: 5	☐ :	☐ IEC :

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
1	BOUGHT OUT ITEMS (ELECTRICAL COMPONENTS)				M	T / C							
1.1	AIR CIRCUIT BREAKER	VERIFICATION OF MAKE, TYPE RATING	MAJOR	VISUAL	100%		IS 13947 , TECH SPEC AND APPROVED DRG	IS 13947 , TECH SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
		ROUTINE TEST	CRITICAL	ELECT	100%				SUPPLIER TC	V	V	V	
1.2	MCCB	VERIFICATION OF MAKE, TYPE, RATING	MAJOR	VISUAL	10% OF EACH TYPE		IS 13947 , SPEC AND APPROVED DRG	IS 13947 , SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		FUNCTIONAL	10% OF EACH TYPE				LOG BOOK	P	V	V	
1.3	ROTARY SWITCHES (CONTROL AND SELECTOR)	VERIFICATION OF MAKE, TYPE, RATING	MAJOR	VISUAL	5 SAMPLE OF EACH TYPE		TECH SPEC AND APPROVED DRG	TECH SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		FUNCTIONAL	10%					P	V	V	
1.4	DOOR , TOGGLE & TNC SWITCH	VERIFICATION OF MAKE, TYPE, RATING	MAJOR	VISUAL	10% OF EACH TYPE		TECH SPEC AND APPROVED DRG	TECH SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
1.5	SWITCH FUSE UNITS	VERIFICATION OF MAKE, TYPE, RATING	MAJOR	VISUAL	10%		IS 13947, TECH SPEC AND APPROVED DRG	IS 13947 , TECH SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
		CONTINUITY TEST	MAJOR	FUNCTIONAL	10% OF EACH RATING					P	V	V	

MANUFACTURER/ SIGNATURE	LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMER: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION								
								APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
1.6	ETHERNET SWITCH	MAKE, TYPE , RATING MODEL	MAJOR	VISUAL	100%		TECH SPEC AND APPROVED DRG	TECH SPEC AND APPROVED DRG	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		ELECT	100%				SUPPLIER TC	V	V	V	
1.7	CONTROL TRANSFORMER	MAKE, TYPE, RATING VOLTAGE RATIO & CLASS	MAJOR	VISUAL NAME PLATE	10% OF EACH RATING		IS 121021 (81)	IS 121021(87)	LOG BOOK	P	V	V	
		VOLTAGE RATIO			100% OF EACH RATING				LOG BOOK	P	V	V	
		ROUTINE TEST		ELEC	100%				SUPPLIER TC	V	V	V	
1.8	CURRENT TRANSFORMER CTS	MAKE, TYPE, RATING VOLTAGE RATIO	MAJOR	VISUAL NAME PLATE	10% OF EACH RATING		IS 2705 (92)	IS 2705(92)	LOG BOOK	P	V	V	
		ROUTINE TEST		ELECT	100%				SUPPLIER TC	V	V	V	
1.9	VOLTAGE/ POTENTIAL/ TRANSFORMER PTS	MAKE, TYPE, RATING VOLTAGE RATIO	MAJOR	VISUAL NAME PLATE	10% OF EACH RATING		IS 2705 (92) APPROVED DRG/TECH SPEC	IS 2705(92) APPROVED DRG	LOG BOOK	P	V	V	
		ROUTINE TEST		ELECT	100%				SUPPLIER TC	V	V	V	
		TRANSDUCCERS CURRENT AND VOLTAGE	MAKE, TYPE, RATING	MAJOR	VISUAL	10% OF EACH RATING		IS 14570 /IEC 16088 APPROVED DRG /TECH SPEC/	IS 14570 /IEC 16088 APPROVED DRG /TECH SPEC	LOG BOOK	P	V	V

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		APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
	(CTD & VTD)	ROUTINE TEST INCLUDING CALIBRATION AND ACCURACY TEST		ELECT	100%				SUPPLIER TC	V	V	V	
1.10	HRC FUSE, FUSE BASE,	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		IS 13703 P-2 TECH SPEC AND APPROVED DRG/ MANFR CATLOGUE	IS 13703 P-2 TECH SPEC AND APPROVED DRG/ MANFR CATLOGUE	LOG BOOK	P	V	V	
		CONTINUITY TEST		ELECT							P	V	V
1.11	NEUTRAL LINK	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		TECH SPEC AND APPROVED DRG/ MANFR CATLOGUE	TECH SPEC AND APPROVED DRG/ MANFR CATLOGUE	LOG BOOK	P	V	V	
1.12	NEUMERICAL RELAY	MAKE, TYPE, RATING	MAJOR	VISUAL	100%		APPROVED DRG/ TECH SPEC	APPROVED DRG/TECH SPEC	LOG BOOK	P	V	V	
		ROUTINE TEST		ELECT	100%					SUPPLIER TC	V	V	V
		RELAY TESTING		ELECT	10% OF EACH TYPE		IEC 60255	IEC 60255		P	W	W	
1.13	OVERLOAD RELAY	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		IS 3231(86) / APPROVED DRG/TECH SPEC	IS 3231(86) / APPROVED DRG/TECH SPEC	LOG BOOK	P	V	V	
1.14	INTERPOSING RELAY	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH SPEC/MNFR CAT	APPROVED DRG/TECH SPEC/MNFR CAT	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		ELECT	5% OF EACH TYPE						P	V	V
1.15		MAKE, TYPE, RATING		VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH	APPROVED DRG/TECH	LOG BOOK	P	V	V	

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			APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
										M	T	C	
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
	TIMERS	CONTACT CONFIGURATION	MAJOR	ELECT	5% OF EACH TYPE		TECH SPEC/ MNFR CAT	TECH SPEC/ MNFR CAT	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		ELECT	5% OF EACH TYPE				LOG BOOK	P	V	V	
1.16	THERMOSTAT	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH SPEC/MNFR CAT	APPROVED DRG/TECH SPEC/MNFR CAT	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK		ELECT	5% OF EACH TYPE				LOG BOOK	P	V	V	
1.17	SPACE HEATER	MAKE TYPE RATING	MAJOR	VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
		FUNCTIONAL CHECK	MAJOR	ELECT	5% OF EACH TYPE				LOG BOOK	P	V	V	
1.18	INDICATING INSTRUMENTS AMMETER, VOLTMETER	MAKE, TYPE, RANGE & CLASS	MAJOR	VISUAL	5% OF EACH TYPE		IS 1248(93) APPROVED	IS 1248(93) /APPROVED	LOG BOOK	P	V	V	
		ROUTINE TEST		ELECT	5% OF EACH TYPE				SUPPLIER TC	P	V	V	
1.19	INDICATING LAMPS	MAKE, TYPE, RATING AND COLOR	MAJOR	VISUAL	5% OF EACH TYPE		IS 1901/APPROVED DRG	IS 1901 /APPROVED DRG	LOG BOOK	P	V	V	

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		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
1.20	PUSH BUTTON SWITCHES	MAKE, TYPE, RATING AND COLOR	MAJOR	VISUAL	5% OF EACH TYPE		IS 4794/APPROVED DRG	IS 4794 /APPROVED DRG	LOG BOOK	P	V	V	
1.21	2/3 PIN SOCKET/LAMP HOLDER/HOOTER	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
1.22	TERMINAL BLOCK FOR POWER AND CONTROL CKT	MAKE, TYPE, RATING	MAJOR	VISUAL	5% OF EACH TYPE		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
1.23	AC/ DC POWER AND AUX CONTACTORS	MAKE, TYPE, RATING	MAJOR	VISUAL	100%		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
		FUCTIONAL		ELECT	5 % OF EACH TYPE				LOG BOOK	P	V	V	
1.24	BUSBAR SUPPORT INSULAOR	MAKE, TYPE, RATING, DIM.	MAJOR	VISUAL AND PHY	5 % OF EACH TYPE		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
		IR/ HV TEST	MAJOR	ELECT	-DO-		-DO-	-DO-	SUPPLIER TC/ LOG BOOK	P	V	V	
1.25	SHROUDS (FIRE RESISTANT TYPE)	MAKE, TYPE	MAJOR	VISUAL	ONE SAMPLE OF EACH TYPE		APPROVED DRG/TECH SPEC/MANFR CAT	APPROVED DRG/TECH SPEC/MANFR CAT	LOG BOOK	P	V	V	
		HV TEST	MAJOR	ELECT	-DO-		2.5 KV FOR 1 MIN WITHSTAND	2.5 KV FOR 1 MIN WITHSTAND	SUPPLIER TC/ LOG BOOK	P	V	V	
		FLAME RESISTANCE TEST	MAJOR	FLAME TEST	SAMPLING AS PER MNFT STD		MNFR STDQ	MNFR STD	SUPPLIER TC	V	V	V	

MANUFACTURER/ SIGNATURE	LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMR: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION		
		APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0							
				ITEM : L V SWITCH BOARDS										
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.	
1.26	POWER AND CONTROL CABLES	MAKE, TYPE, RATING	MAJOR	VISUAL	5 SAMPLES OF EACH TYPE		IS 694(90)	IS 694(90)	LOG BOOK	P	V	V		
1.27	CABLE LUGS	MAKE, TYPE, SIZE	MAJOR	VISUAL/ MEASUR	5% SAMPLES OF EACH TYPE		APPROVED DRG/MANFR CAT	APPROVED DRG/MANFR CAT	LOG BOOK	P	V	V		
1.28	PVC WIRE	SIZE, COLOUR, BIS MARKING	MAJOR	VISUAL	100%		PO SPEC, DRG IS 694	PO SPEC, DRG IS 694	LOG BOOK	P	V	V		
2	BOUGHT OUT ITEMS (MECHANICAL COMPONENTS)													
2.1	ENCLOSURE	SIZE, TYPE	MAJOR	VISUAL/ MEASUR	100%		APPROVED DRG, IS 8623	APPROVED DRG, IS 8623	LOG BOOK	P	V	V		
		COLOUR (PAINT SHADE), SURFACE FINISH	MAJOR	VISUAL	100%		APPROVED DRG/SHADE CARD	APPROVED DRG/IS/SHADE CARD	LOG BOOK	P	V	V		
		PAINT THICKNESS AND ADHESION TEST.	MAJOR	TEST	RANDOM		APPROVED DRG/	IS 6005/ APPROVED DRG.	LOG BOOK	P	V	V		
2.2	ENCLOSURE ANGLES, CHANNELS AND SHEET(CR)/ GLAND PLATE	DIMENSION/THICKNESS	MAJOR	MEASUR	5% OF EACH TYLPE		APPROVED DRG	APPROVED DRG	SUPPLIER TC	V	V	V		
		SURFACE FINISH, CHCEK FOR WAVINESS AND FLATNESS	MAJOR	VISUAL	5% OF EACH TYLPE		APPROVED DRG	APPROVED DRG	SUPPLIER TC	V	V	V		
		TENSILE / BENDING STRENGTH	MAJOR	MECH	AS PER IS		IS 513/ IS 1079/ IS 2062	IS 513/ IS 1079/ IS 2062	SUPPLIER TC	V	V	V		
				LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMR: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION										
MANUFACTURER/ SIGNATURE														
									APPROVED BY					APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)				CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0					
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
2.3	BUSBAR: AL & CU	SIZE	MAJOR	MEASUR	1 SAMPLE OF EACH TYPE		IS 5082(FOR AL)/ IS 1897 (FOR CU)/ APPROVED DRG/ TECH SPEC	IS 5082(FOR AL)/ IS 1897 (FOR CU)/ APPROVED DRG/ TECH SPEC	LOG BOOK	P	V	V	
		SURFACE FINISH	MAJOR	VISUAL	-DO-		IS 5082 & IS 1897	IS 5082 & IS 1897	LOG BOOK	P	V	V	
		CONDUCTIVITY	MAJOR	ELECT	AS PER IS		IS 5082 & IS 1897	IS 5082 & IS 1897	SUPPLIER TC	P	V	V	
		CHEMICAL / MECH PROPERTY	MAJOR	CHEM & MECH	AS PER IS		-DO-	-DO-	SUPPLIER TC	P	V	V	
2.4	EARTH BUS BAR	SIZE, MATERIAL	MAJOR	PHYSIC AL/ MEASUR	1 SAMPLE /LOT		IS 3043	IS 4043	LOG BOOK/ SUPPLIER TC	V	V	V	
2.5	CABLE GLAND	MAKE, TYPE, SIZE	MAJOR	VISUAL/ MEASUR	5 SAMPLES / LOT		APPROVED DRG/MANFR CAT	APPROVED DRG/MANFR CAT	LOG BOOK	P	V	V	
2.6	GASKET	MATERIAL TYPE	MAJOR	VISUAL	1 SAMPLE OF EACH TYPE AND SIZE		IS 11149 TECH SPEC / APPROVED DRG	IS 11149 TECH SPEC / APPROVED DRG	LOG BOOK	P	V	V	
		DIMENSION, SHORE HARDNESS, FLAME TEST	MAJOR	MEASUR /PHY	-DO-		-DO-`	-DO-	LOG BOOK	P	V	V	
		COMPRESSION , ELONGATION AT BREAK AND AGING, TEST,OZONE RESISTANCE	MAJOR	TEST	-DO-		-DO-	-DO-	SUPPLIER TC	V	V	V	
3.0	IN-PROCESS										V	V	

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				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
3.1	PRE TREATMENT AND PAINTING (POWDER COATING)	1. CHEMICAL CONCETRATIOIN CHECK OF ALL TANIKS FOR PRE TREATMENT OF SHEET STEEL (7 TANK PROCESS)	MAJOR	CHEMIC AL	MANFR STD		MANFR STD/ IS 6005	MANFR STD/ IS 6005	SUPPLIER TC	V	V	V	
		2. PAINT SHADE	MAJOR	VISUAL	1 SAMPLE PER LOT		TECH. SPEC./ APPROVED DRAWING	TECH. SPEC./ APPROVED DRAWING	SUPPLIER TC/ LOG BOOK	V	V	V	
		3. PAINT THICKNESS AND ADHESION	MAJOR	MEASUR / TEST	MANUF. PRACTICE		TECH. SPEC./ APPROVED DRAWING	TECH. SPEC./ APPROVED DRAWING	SUPPLIER TC/ LOG BOOK	V	V	V	
3.2	DRAWOUTS	SIZE/ TYPE	MAJOR	MEASUR	1 NO OF EACH TYPE		APPROVED DRG	APPROVED DRG	SUPPLIER TC/ LOG BOOK	V	V	V	
		TYPE OF COATING FOR BASE AND FRAME	MAJOR	VISUAL	1 NO OF EACH TYPE		-DO-	-DO-	SUPPLIER TC/ LOG BOOK	V	V	V	
		COATING THICKNESS	MAJOR	MEASUR	-DO-		-DO-	-DO-	SUPPLIER TC/ LOG BOOK	V	V	V	
3.3	ASSEMBLY OF ELECTRICAL COMPONENTS	LOCATION OF COMPONENTS, ACCESSIBILITY FOR ATTENDING / WIRE TIGHTENING	MAJOR	VISUAL	100%		PO SPEC, DRG, IS 8623	PO SPEC, DRG, IS 8623	LOG BOOK	P	V	V	
		CLEARANCE OF BUS BARS OF DIFFERENT PHASES AND EARTH	MAJOR	MESH	100%		PO SPEC, DRG, IS 8623	PO SPEC, DRG, IS 8623	LOG BOOK	P	V	V	

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				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
		SHROUDING OF POWER TERMINALS	CRITIC AL	VISUAL	100%		PO SPEC, DRG, IS 8623	PO SPEC, DRG, IS 8623	LOG BOOK	P	V	V	
4.0 FINAL INSPECTION													
4.1	VERIFICATION OF DEMENSION OF VERTICALS, SHEET. VISUAL CHECK FOR VERTICALITY, ALLIGNMENT OF PANELS.		MAJOR	VISUAL & MEASUR	100%		AS PER APPROVED DRG.GA	AS PER APPROVED GA DRG.	LOG BOOK	P	W	W	
4.2	VERIFICATION OF PAINT FINISH, SHADE, THICKNESS & ADHESIION TEST		MAJOR	VISUAL AND MEASUR	100% FOR SHADE AND FINISH 2-3 SAMPLES FOR THICKNESS AND ADHESION 2-3 SAMPLES/ BOARD		AS PER IS/ APPROVED DRG GN	AS PER IS/ APPROVED DRG GN	INSPECTIO N REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.3	VERIFICATION OF BUSBAR (MAIN, CONTROL AND AUX). MATERIAL, COLOR CODING, PHASE SEQUENCE IDENTIFICATION, PROVISION OF COLOR (R-Y-B) / BLACK HEAT SHRINKING SLEEVE. & EARTH BUSBAR		CRITICA L	VISUAL AND MEASUR	10%		APPROVED DRG GA	APPROVED DRG GA	INSPECTIO N REPORT	P	W	W	

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			APPROVED BY	APPROVAL SEAL

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				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
										M	T	C	
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
4.4	MEASUREMENT OF TIGHTENING TORQUE OF BUSBAR JOINTS BY TROQUE WRENTCH		CRITICAL	MECH	10%		M6 = 0.30- 0.7KGFM M8 = 1.25- 2.5KGFM M10= 2.50- 4.0KGFM M12= 4.30- 7.0KGFM	M6 = 0.30- 0.7KGFM M8 = 1.25- 2.5KGFM M10= 2.50- 4.0KGFM M12= 4.30- 7.0KGFM	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.5	BUS BAR SUPPORT ARRANGEMENT, CENTRE TO CENTRE DISTANCE (CREEPAGE DISTANCE)		MAJOR	VISUAL AND MEASUR	10%		APPROVED DRG GA	APPROVED DRG GA	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.6	MOUNTING ARRANGEMENT OF COMPONENTS AND COMPONENT IDENTIFICATION FOR MAKE, TYPE, RATING AND LAYOUT		MAJOR	VISUAL	100% FOR EACH TYPE OF MODULE		APPROVED DRG/MANFR STD	APPROVED DRG/MANFR STD	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.7	VERIFICATION OF CONTROL WIRING, TERMINAL ARRANGEMENT AND FERRULING		MAJOR	VISUAL	100%		APPROVED DRG/MANFR STD	APPROVED DRG/MANFR STD	INSPECTION REPORT	P	W	W	
4.8	VERIFICATION OF SINGLE LINE DIAGRAM COMPONENTS AND LEGENDS		MAJOR	VISUAL	100%		APPROVED DRG SLD	APPROVED DRG SLD	INSPECTION REPORT	P	W	W	
4.9	VERIFICATION OF MOUNTING ARRANGEMENT OF COMPONENT , IDENTIFICATION OF COMPONENT AND VERIFICATION OF MAKE, TYPE & RATING (AS PER BOM)		MAJOR	VISUAL	100%		AS PER APPROVED DRG(SCHEME) AND APPROVED BOM	AS PER APPROVED DRG(SCHEME) AND APPROVED BOM	INSPECTION REPORT	P	W	W	

MANUFACTURER/ SIGNATURE	LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMR: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION			
			APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M T C			REMARKS
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
4.10	VERIFICATION OF DOOR INTERLOCK AND DEFEAT INTERLOCK		MAJOR	PHYSICAL	100%		APPROVED GN	APPROVED GN	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.11	VERIFICATION OF DEGREE OF PROTECTION AND FIXING OF GASKETS		MAJOR	PHYSICAL	2-5 SAMPLES AT GASKETED JOINTS PER BOARD		APPROVED GN	NO INSERTION POSSIBLE FROM OPENINGS AND GASKETTED JOINTS	INSPECTION REPORT	P	W	W	PAPER INSERTION METHOD FOR IP5X COMPARTMENT AND WIRE INSERTION METHOD FOR IP 4X COMPARTMENT RANDOM CHECK
4.12	ACB OPERATION TEST AT SERVICE, TEST AND ISOLATION POSITION & CHECK OF MECHANICAL INTERLOCK AND ANTI PUNPING AND TRIP FREE FEATURE		CRITICAL	ELECT	100%		APPROVED DRG/TECH SPEC	APPROVED DRG/TECH SPEC	INSPECTION REPORT	P	W	W	10% RANDOM SAMPLE BY CUSTOMER
4.13	VERIFICATION OF INTER CHANGEABILITY OF SIMILAR MODULES AND CHECK FOR ALIGNMENT OF POWER AND CONTROL CONTACTS.		MAJOR	VISUAL & MECH	RANDOM		APPROVED TECH SPEC	APPROVED TECH SPEC	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER
4.14	FUNCTIONAL CHECK / LOGIC CHECK (1. Operation of Instrument & Relays 2. Functional Check of Control Function & Interlock in test & service Position. 3. Relay calibration Tests.)		MAJOR	ELECT	100%		AS PER APPROVED SCHEME	AS PER APPROVED SCHEME	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.15	IR TEST BEFORE HV TEST ON POWER CKT AND CONTROL CKT		CRITICAL	ELECT	100%		IS 8623	IS 8623	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.

MANUFACTURER/ SIGNATURE	LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMER: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION			
			APPROVED BY	APPROVAL SEAL

		MANUFACTURER: BHARAT HEAVY ELECTRICALS LTD.- ELECTROPORCELAINS DIVISION BANGALORE 560012		MANUFACTURING QUALITY PLAN (TENTATIVE)			CUSTOMER: NSPCL PROJECT: 1X250 MW ROURKELA POWER PROJECT Technical specification: EPD-TS-CPBG-CPJ07-11, REV-0						
				ITEM : L V SWITCH BOARDS									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CATSS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
										M	T	C	
1.	2.	3.	4.	5.	6.		7.	8.	9.	10.			11.
4.16	HV TEST ON POWER CKT AND CONTROL CKT		CRITICAL	ELCECT	100%		IS 8623	IS8623	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.17	IR TEST AFTER HV TEST ON POWER CKT AND CONTROL CKT		CRITICAL	ELECT	100%		IS 8623	IS 8623	INSPECTION REPORT	P	W	W	RANDOM SAMPLES BY CUSTOMER.
4.18	TYPE TEST		CRITICAL	ELECT	1/ ITEM		PO SPEC, DRG IS 60529 IS 8623	PO SPEC, DRG IS 60529 IS 8623	INSPECTION REPORT	P	V	V	AS PER BELOW NOTE
4.19	CHECK SHROUDING OF ACCECABLE LIVE PARTS		MAJOR	VISUAL	10%		AS PER TECH SPEC	AS PER TECH SPECH	INSPECTION REPORT	P	W	W	
4.20	PROVISION OF ADDITIONAL TAPPED HOLES AND FASTENERS FOR EARTH CONNECTION AND EARTH SYMBOL		MAJOR	VISUAL	100%		AS PER TECH SPEC	AS PER TECH SPECH	INSPECTION REPORT	P	V	V	

NOTE:

- A. ONLY APPROVED MAKE OF COMPONENTS USED.
- B. TYPE TESTS WILL INCLUDE
1. DEGREE OF ENCLOSURE PROTECTION (AS PER IEC 60529)
 2. TEMPERATURE RISE TEST (AS PER IS 8623)
 3. SHORT CIRCUIT TEST (AS PER IS 8623)
- C. FUNCTIONAL/ PERFORMANCE CHECKS TO BE CONDUCTED ON ENTIRE BOARD WHILE ALL POWER SUPPLIES SWITCHED ON.

MANUFACTURER/ SIGNATURE	LEGEND: M: MANUFACTURER : VENDOR, T: CONSULTANT : TCE & BHEL, C: CUSTOMR: RRVUNL P: PERFORM, W: WITNESS, V: VERIFICATION			
			APPROVED BY	APPROVAL SEAL



**NSPCL ROURKELA POWER PROJECT
(PP-III:1X250MW)
TECHNICAL SPECIFICATION FOR
LOW VOLTAGE SWITCHGEAR
(ESP, CHP & AHP PACKAGE)**

SPECIFICATION NO. : EPD-TS-CPBG-CPJ07-11, REV-0

VOLUME II-B

SECTION -

REVISION
0

DATE: 24/05/2018

SHEET 1 OF 1

MAKE OF COMPONENT

COMPONENT	MAKE
ACB	C&S ELECTRIC, NOIDA
	L&T, MUMBAI
	GE, BANGALORE
	SIEMENS, GERMANY
	SCHNEIDER, FRANCE
	ABB, BANGALORE
IEC 61850 COMPLIANT NUMERICAL RELAY	SEL, PULLMAN USA
	ALSTOM T&D, STAFFORD-UK (P14X, P34X, P44X, P64X, P74X MODELS ONLY)
	ALSTOM T&D, CHENNAI (P14X, P34X, P44X, P64X, P74X MODELS ONLY)
	GE MULTILIN, ZAMUDIO/VIZEAYA (SPAIN)/ MARKHAM/ONTARIO(CANADA) (F650 ONLY)
	SCHNEIDER, STONE(UK) (PX30 & PX40 MODELS ONLY)
	ABB, FINLAND
	ABB, BARODA (FOR 6XX SERIES)
	SIEMENS, GOA (7SR2X SERIES ONLY)
	SIEMENS GERMANY (7SX SERIES ONLY)
BOI'S	WITH VDE/CE/UL/CSA MARKED OR BIS APPROVED WITH VALID CML NO.